FY2016
4TH QUARTER
INL/EXT-16-40166

IDAHO NATIONAL LABORATORY

QUARTERLY OCCURRENCE ANALYSIS

DEEPER LEARNING THROUGH EVENT ANALYSIS

Contents

***INL/EXT*-16-40166**

FY-16 4th Quarter

This report is published quarterly by the Idaho National Laboratory (INL) Quality and Performance Management Organization.

The Department of Energy (DOE) Occurrence Reporting and Processing System, as prescribed in DOE Order 232.2, "Occurrence Reporting and Processing of Operations Information," requires a quarterly analysis of events, both reportable and not reportable, for the previous 12 months.

This report is the analysis of 84 reportable events (29 from the 4th quarter fiscal year 2016 and 55 from the prior three reporting quarters), as well as 39 other issue reports (including events found to be not reportable and Significant Category A and B conditions) identified at INL during the past 12 months (two from this quarter and 37 from the prior three quarters).

Battelle Energy Alliance (BEA) operates INL under contract DE-AC07-051D14517.

Highlights…

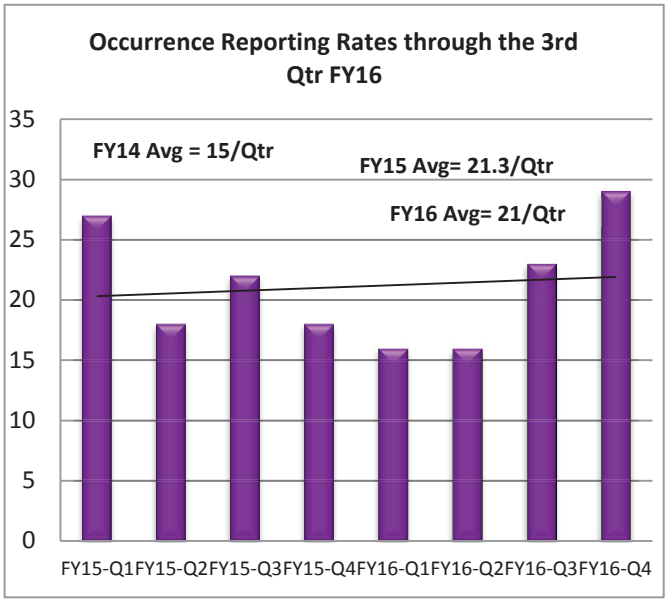
Idaho National Laboratory reported 29 events this quarter. The quarterly average number of reportable events at the INL has increased from 15 in fiscal year (FY)-14 to 21.3 in FY-15 and 21 in FY-16. Thirty eight percent of the 4th quarter (Qtr) FY16 events were associated with equipment problems.

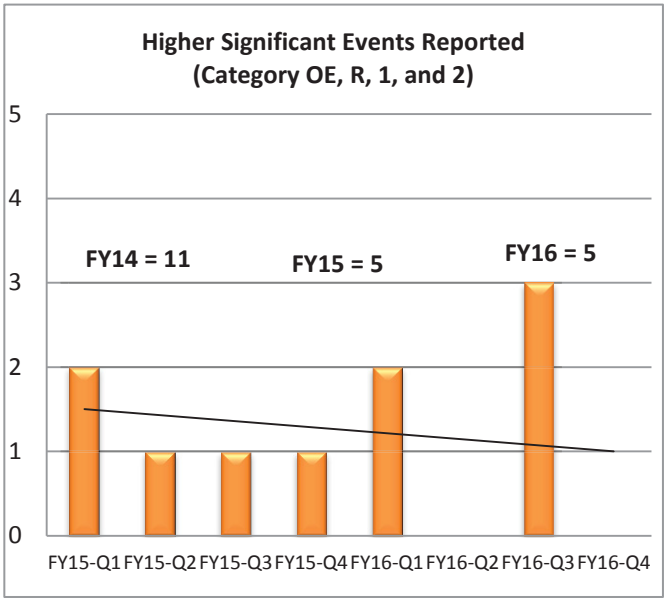
The rate of higher significant events (those reported as Operational Emergencies, Recurring Issues, and/or Significance Categories 1 or 2) continues to trend downward, and no higher significant category events were reported during the 4th Qtr FY16.

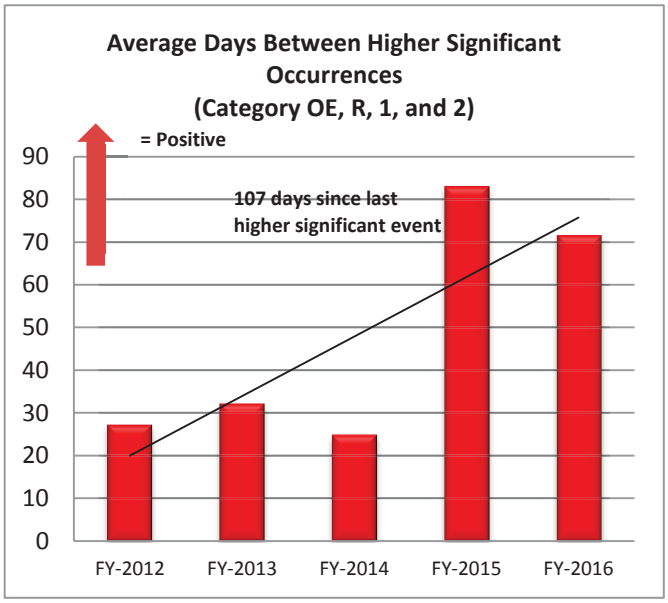
Over the past 24 months, the average number of days between significant occurrences is trending in a positive direction and 107 days have passed since a higher significant event occurred.

Additional analysis on a noted trend regarding events related to hazardous energy controls was completed and is summarized in this report.

This quarterly analysis reviews reportable and non-reportable events and provides a summary of the more significant Lessons Learned issued by INL.





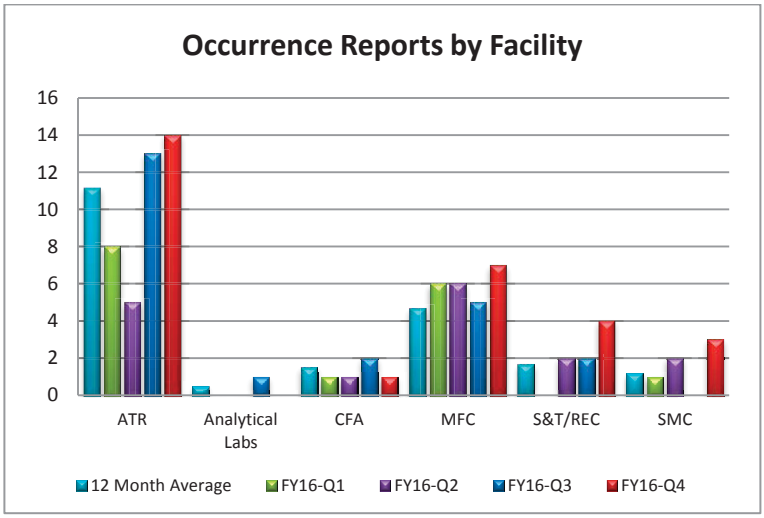


From July 1, 2016 through September 30, 2016, INL reported 29 new events to Department of Energy (DOE), in accordance with DOE Order 232.2, "Occurrence Reporting and Processing of Operations Information." These events were analyzed to determine commonalities related to: Operational Emergencies (Group 1), Personnel Safety and Health (Group 2), Nuclear Safety Basis (Group 3), Facility Status (Group 4), Environmental (Group 5), Contamination and Radiation Control (Group 6), Nuclear Explosive Safety (Group 7), Packaging and Transportation (P&T) (Group 8), Noncompliance Notifications (Group 9), and Management Concerns (Group 10).

In addition, INL reported two events and conditions through Initial Notification Reports (INRs) and INL's local issues tracking software (LabWay) that did not meet Occurrence Reporting and Processing System (ORPS) reporting thresholds.

TREND SNAPSHOT

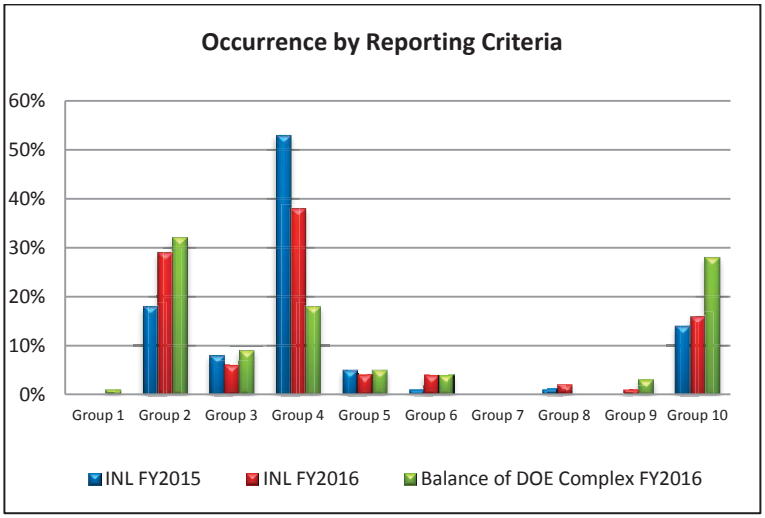
Occurrences by Facility: During the reporting quarter, the Advanced Test Reactor (ATR) reported nearly half of the events that occurred. ATR was in a reactor turnaround and 64% of the events reported at ATR this quarter were associated with performance degradation of a Safety Class Safety Significant Component when the equipment is not required to be operable. This trend is not unexpected.



TREND SNAPSHOT

Occurrences by Reporting Criteria:

During the 4th Qtr FY-16, INL has experienced the majority of events related to: Group 4, Facility Status (38%), Group 2, Personnel Safety and Health (29%); and Group 10, Management Concerns (16%). Comparative analysis to the balance of the DOE Complex is shown in the chart to the right and is explained in each section of the report that follows. In most cases, INL closely mirrors reporting across the DOE Complex. The balance of the DOE Complex reports the majority of events in Group 2 (32%) Group 10, Management Concerns (28%), and Group 4 (18%).



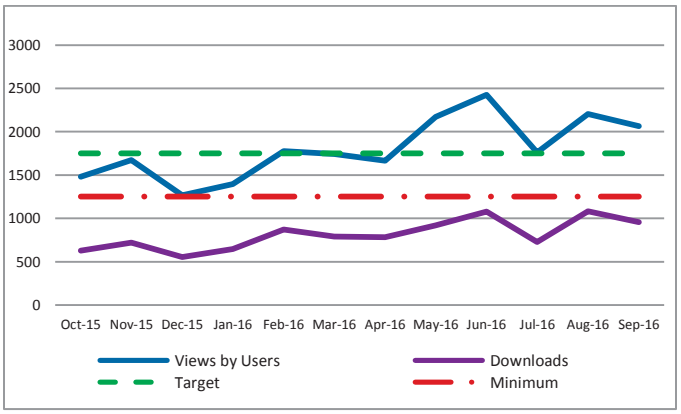
TREND SNAPSHOT

Lessons Learned: The use of INL's Lessons Learned program continued to increase engagement of operating experience and lessons learned. The average number of views per month during the quarter was 2,010 exceeding the average monthly goal of 1,750 views. Field observations during the quarter identified several good examples of lessons learned used at INL.

The INL Lessons Learned Program is an integral part of the feedback and improvement processes required by DOE. INL uses the OPEXShare platform (www.opexshare.doe.gov) to facilitate the sharing of information and operational experience. Those lessons that are generated by INL and that INL feels are most significant or novel are in turn shared across the complex through the DOE Headquarters Lessons Learned Program database. During FY-16, INL has shared 46 such lessons through the OPEXShare, 13 of which were shared this quarter. These include:

- INL-2016-0027, Transient Reactor (TREAT) Lockout Tagout (LOTO) Device Condition
- INL-2016-0030, Buna-N O-ring Degradation due to Environmental Conditions
- INL-2016-0031, Workers Sprayed with Herbicide
- INL-2016-0032, Worker Enters a Radiological Buffer Area without Radiological Controls Support
- INL-2016-0033, Automatic Reactor Shutdown Occurs During Training Practical Examination
- INL-2016-0023, Exemplary Response to Injured Tour Member
- INL-2016-0044, Pre-Cast Concrete Lifting Insert Failure Results in Dropped Load
- INL-2016-0034, Inadequate Assumptions Derived in Engineering Calculation and Analysis Report
- INL-2016-0046, No General Access + No Badge = Problem
- INL-2016-0047, Hoist Cable Damage Causes Electrical Short
- INL-2016-0048, INL Quarterly Occurrence Analysis - 3rd Quarter FY 2016
- INL-2016-0029, Damage to Canal Parapet during Crane Use
- INL-2016-0039, Modified Drill Socket Causes Severe Finger Trauma

Operational excellence requires the use of internal and external operating experience information (OEI) to minimize the likelihood of undesirable behaviors and promote noteworthy practices. Lessons learned are systematically evaluated and implemented to continuously improve performance. INL embraces the philosophy that lessons learned are lessons applied.



During the 4th Qtr FY-16, INL used internally generated and/or shared lessons from other sites to improve operations and learn from other's events or mistakes. Thirteen such lessons were internally generated and entered into OPEXShare to be shared with all INL organizations. These are summarized below:

Treat Lockout Tagout Device Condition

Lessons 2016-0027

On January 14, 2016, the TREAT DOE Facility Representative questioned the condition of a Simple LOTO locking device and pointed it out to the Operations manager. The ability of the device to prevent operation of the associated 120 volt (V) breaker was called into question. The Operations Manager contacted the Facility Area Supervisor (FAS) and confirmed no work was being performed under the LOTO in question and removed the effected work from the approved Plan of the Day. An inspection of all installed LOTO's was performed to ensure no other devices exhibited the same issue. Communication with the Authorized Workers on the LOTO

confirmed the system had been locked out but work had not started and the system was in its normal configuration. Additionally, it was noted that the workers had verified the installation and adequacy of the locking device as part of the LOTO process when the locking device was initially installed. The workers removed their personal locks and the suspect locking device and replaced it with one that clearly prevented operation of the breaker.

Issues identified during the inspection of device found that due to slight play in the locking device, a configuration could result in a condition that would allow the breaker to be shut with the locking device in place.

What We Can Learn:
Locking devices of the same type, but different manufacturers, may not always provide the same physical dimensions or operability which could lead to a non-compliant condition.

Buna-N O-ring Degradation due to Environmental Conditions

Lessons 2016-0030

In 2013, the Fuel Manufacturing Facility (FMF) experienced a problem with the Special Nuclear Material (SNM) Glovebox where the glovebox inert atmosphere could not be maintained. The problem was ultimately diagnosed as numerous O-ring failures in Klein Flanche (KF)-type flanges. A campaign was undertaken to replace all the O-rings in the SNM glovebox. Due to the history of this problem and that the Neptunium Repackaging Glovebox (NRG) and Transuranic Breakout Glovebox (TBG) were manufactured by the same supplier as the purification system on the SNM glovebox, in November 2015 all O-rings on the NRG and TBG assemblies were replaced with Viton material O-rings.

The results of the examination of the O-rings replaced in the NRG and TBG were alarming. For being one to two years old, the O-rings showed significant degradation. Eighty percent (70 out of 88) of the KF-40 O-rings showed various degrees of degradation; and 90% (29 out of 32) KF-25 O-rings showed severe degradation. No degradation was found in any of the KF-50 O-rings. All KF-25 and KF-40 O-rings were constructed of Buna-N material, while the KF-50 O-rings were constructed of Viton.

Upon further investigation degraded O-rings were discovered in glovebox equipment at the Space and Security Power System Facility (SSPSF) at Materials and Fuel Complex (MFC). Los Alamos National Laboratory also found degraded O-rings at their facility associated with Central Research Lab's glove port support rings. All degraded rings were constructed of Buna-N (Nitrile) material.

In addition, the FMF recently discovered degraded Buna-N O-rings in the MFC warehouse supply of spares, prior to placing the O-rings into service.

ISSUES

A failed O-ring can cause a breach in glovebox containment and can lead to release of contamination or loss of inert atmosphere. The investigation found that Buna-N O-ring material is rapidly degrading under environmental conditions at MFC.

WHAT CAN WE LEARN

- Evaluate existing O-ring installations to determine if Buna-N O-rings were used and may be suspect of potential degradation.
- Update material specifications for new glovebox equipment and spare parts to use alternate polymer material such as Viton or Neoprene. Material selection should consider the capability of the processes including material durometer, operating temperatures, and exposure to vaporous chemicals.
- O-rings should not be stored under tension. Purchase O-rings separately from KF centering rings to ensure the O-rings are not mounted on centering rings (under tension) while in storage.

Workers Sprayed with Herbicide

Lessons 2016-0031

Two INL workers were sprayed with herbicide from a spray truck after the boom portion of the system was removed from service and the hose and solenoid valve removed. This portion of the system was isolated by a ball valve and had a 90-degree elbow installed at the end of the piping.

While performing on-the-job training, a qualified herbicide applicator inadvertently opened the ball valve that was isolating the removed piping. The action resulted in the qualified applicator and a trainee being sprayed with herbicide. Both personnel immediately flushed their eyes and face, reported to medical, and showered. They were released back to work with no restrictions.

Following the event the elbow was removed and a plug installed at the ball valve to prevent this from happening again if the equipment had to be used before maintenance was complete.

ISSUES

- The spray truck was used with part of the spray system out of service. There was not a formal evaluation on possible hazards and mitigations prior to using the truck in the current configuration.
- Time pressure was a factor in the event. The weather was nice with little wind and presented an ideal situation for spraying weeds. The parts to repair the spray system had been ordered but had not arrived; however, personnel decided to proceed in spite of the configuration of the truck.

WHAT CAN WE LEARN

- Careful consideration should be made prior to putting equipment back in service when it cannot be operated as designed. Management and safety personnel should be involved to ensure use of the equipment is appropriate, necessary, and all hazards have been identified and mitigated.
- Due to changes in the configuration of the sprayer mechanism, a single point of failure was present that allowed the workers to be exposed to the chemical with only one irrecoverable action. Defense in depth was not present.

Worker Enters Radiological Buffer Area without Radiological Controls Support

Lessons 2016-0032

Without first contacting Radiological Controls for escort or permission, a construction worker at ATR dropped a Radiological Buffer Area (RBA) boundary rope from an unestablished entrance/exit point and entered the area with a forklift. Radiological Controls personnel arrived on the scene and counseled the worker on the need to have Radiological Controls personnel present prior to entry into such areas.

Work was stopped, supervision was notified and the forklift was surveyed out of the area. Upon further investigation it was also discovered that the worker was not wearing the required dosimetry and had not been issued an Optically Stimulated Luminescent dosimeter (OSL). Contract management supervision was notified.

ISSUES

The employee portrayed a poor attitude towards good radiological work practices by intentionally removing a RBA boundary and entering the RBA without Radiological Controls support and by overlooking the fact that he should be wearing a dosimeter. The employee also failed to recognize "Stop Work Authority" when another employee identified a problem with him removing a Radiological Controls Boundary.

WHAT CAN WE LEARN

- When interviewing subcontractor superintendents, INL has the opportunity to evaluate the experience level of each superintendent. INL can take this opportunity to remind the superintendents of the danger of a complacent attitude and can express expectations to perform work within the guidelines of INL's work control process. INL can express the importance of having a questioning attitude and encourage other employees on the project to support this attitude.
- It is a good practice to consistently remind employees, in meetings and pre-job briefs, that they all have stop work authority and encourage them to use it when they see something wrong without fear of repercussion.

Automatic Reactor Shutdown Occurs During Training Practical Examination

Lessons 2016-0033

Recently the Neutron Radiography (NRAD) reactor had an automatic shutdown (SCRAM) during a reactor operator (RO) final certification practical examination. The RO under

instruction was executing a manual power change from 50 watts (w) to a desired operating power of 250 kilowatts (kw).

At a power of 209 kw the RO under instruction performed a shim of the regulating rod that was too long in duration which increased power past the desired 250 kw. The entire event lasted approximately three seconds, therefore the RO over watch did not have time to intervene and reduce power. The reactor SCRAM occurred on 110% power (276 kw).

ISSUES

Situational awareness is fluid. The controlling parameter at one point in an evolution may not be the controlling parameter later in the same evolution. This is clearly evident in this event. Early in the power change, the "reactor period" is the controlling parameter but as power increases the controlling parameter transitions to "reactor power." In turn, the issues identified during the investigation included:

- Understanding expected equipment response and identifying the controlling parameters to monitor that response, as well as their interaction or interdependence is important to safe operation.
- In this event, the certifying RO acknowledged that he became tunnel locked on the reactor period and lost awareness of the reactor power. He did not adequately communicate the details of his intended action (shim duration) such that the RO over watch or Reactor Supervisor (RS) could prevent the SCRAM.

WHAT CAN WE LEARN

- Ensure that during a pre-job brief, participants identify if and where control parameters change, and assign roles and responsibilities to ensure that the operation is controlled adequately from start to finish.
- Establish explicitly that the over watch's function is the safe operation of the reactor, not the training of the RO under instruction. Intervention may terminate the certification evolution but that is preferable to an automatic SCRAM. Sufficient response time by the over watch needs to be factored into future certifications.
- Provide procedural cues to inform the operator(s) that a control transition will occur, equipment response will become more sensitive, or that additional care and caution are required to complete a portion of the evolution. Alternatively, inclusion of power margin can reduce over shooting power targets and/or provide some additional response time for the over watch to fulfill his function; the safe operation of the reactor.

Exemplary Response to Injured Tour Member

Lessons 2016-0023

On April 6, 2016, during a tour of the ATR a member of a tour group momentarily passed out, fell, and hit their head within an RBA. The tour member received immediate and appropriate medical attention by trained personnel at the ATR. On-scene personnel determined that an Automated External Defibrillator (AED) should be used to monitor the heart of the injured person. To help ensure the quick removal of the injured tour member, Radiological Control personnel surveyed and cleared a travel path for emergency responders. The individual was transported by ambulance to the Central Facility Area (CFA) Medical Facility for further evaluation.

Exemplary response by ATR personnel helped insure the injured tour member was in stable condition and emergency medical responders where able to access the individual as quickly as possible.

WHAT CAN WE LEARN

<u>For affected individuals and personnel on the scene:</u>

An injured person's best interest always takes priority over radiological concerns. When an injury occurs inside a radiological area, personnel should immediately notify the Radiological Control Department. In doing so Radiological Control Technicians (RCTs) will respond to the scene, help clear a travel path for emergency responders, if possible, and remain with the injured person until they can be released from Radiological Controls.

<u>For all bystanders not critical to the response:</u>

It is essential that all bystanders not critical to the response exit the area and stay clear of the scene. An on-scene

manager noticed a few bystanders starting to gather and took action to clear them from the area.

For all emergency medical technicians and fire fighters arriving on scene:
RCTs and Security will be on location to meet responders at the facility entrance to direct them to the injured person's location. It is important not to hesitate and to respond as trained. Hesitating may delay getting to the injured person in a timely manner. There was no significant hesitation by first responders in this instance but was discussed during a post incident briefing. RCTs are the on scene to provide radiological guidance without hindering medical care. RCTs are trained to travel with the response team and will survey all affected personnel and equipment when conditions are stable.

Pre-Cast Concrete Lifting Insert Failure Results in Dropped Load

Lessons 2016-0044

On August 11, 2016, while loading a pre-cast concrete component at an offsite sub-tier's manufacturing facility, one of three embedded lifting inserts broke causing the concrete component load to quickly shift. As a result of the imposed dynamic load, the remaining two lifting inserts were torn out of the concrete and the product fell to the ground. Distortion of these two lift inserts was visible, but they did not fail. The area was clear of personnel and no one was injured. The sheared head of the lift insert is shown in the photograph below.

The configuration of the load was such that three lifters were being used in the sidewalls of a circular concrete component. The design thickness of the sidewalls is 6 inches and the weight of the concrete component was approximately 23 tons. Prior to the incident, 696 components using at least three of these lifting inserts per component had been successfully fabricated, transported to the construction site, and installed without incident.

The lifting insert in question is a 4 3/8 inches galvanized eye anchor rated at 8 tons, with a 4:1 safety factor. The lifting insert is a forged medium carbon-manganese steel with hot dipped galvanized coating identified as meeting the Chinese National Specification for steel grade. This type of anchor is used primarily in thin-wall precast concrete panels to extend the shear cone through the use of rebar and was procured from a U.S.-based distributor.

Initial Failure Mode Analysis indicates that the procured lift inserts are at risk of fast fracture failure. Because the lift inserts are galvanized, there is no reliable way to inspect the already embedded lifters. There are no discernable markings to provide traceability.

BEST PRACTICES

As a best practice, all lift inserts should be thoroughly evaluated prior to installation, with particular emphasis on coated components for which the ability for visual inspection is hindered. Lift inserts of similar configuration should be used with caution.

Inadequate Assumptions Derived in Engineering Calculation and Analysis Report

Lessons 2016-0044

A Potential Inadequacy in the Safety Analysis (PISA) was identified by INL Nuclear Safety Engineering during the evaluation of Plan (PLN)-3243, "Transport Plan for the Transfer of Material between the MFC and the AMWTP." PLN-3243 describes the INL onsite transportation of Department of Transportation-approved 55-gallon and 85-gallon drums between INL facilities using methodology identified in DOE-STD-5506, "Preparation of Safety Basis Documents for Transuranic Waste Facilities."

ISSUES

The established Technical Safety Requirement control set in PLN-3243 requires that shipments be limited to less than or equal to 40 drums with a combined radioactive material limit of less than or equal to 32 plutonium equivalent curies to limit public dose at an established standoff distance.

- It was determined that these Technical Safety Requirement controls did not protect the assumptions in the accident analysis evaluation for an engulfing fire event.

- The Unreviewed Safety Question (USQ) process found that a postulated package configuration that complies with the limits in the plan could exceed the estimated bounding dose consequence; therefore, the Technical Safety Requirement controls in PLN-3243 were determined to be inadequate.

WHAT CAN WE LEARN

Nuclear safety analysts need to identify and protect analysis assumptions with appropriate controls. DOE STD-5506 methodology for fire impingement on drums is dominated by lid loss and release from exterior drums. In this case, an assumption was made that establishing a combined radioactive material limit for a shipment would bound a release for any configuration of 40 drums or less. This assumption is not valid if an exterior drum was loaded with material greater than that assumed in the bounding analysis. Sensitivity studies should have been performed and controls should have been established to limit the material allowed in exterior drums to ensure the calculated dose consequence of record remained bounded.

Hoist Cable Damage Causes Electrical Short

Lessons 2016-0047

A research fabrication technician was performing pre-use inspections on a Coffing hoist mounted to a Bushman A-frame gantry when the feeder breaker tripped. He observed the 120 volt power cable to the hoist had partially detached at the hoist casing. Employees responded to secure the equipment and report the damaged wiring and circuit trip to facility management. Further investigation found the strain relief had failed and the power cord had rubbed against the hoist casing exposing the conductor. Personnel were not immediately exposed to hazardous energy due to the hoist location being 10 feet above the floor.

ISSUES

It is believed that the cord strain relief degraded over time allowing the cord to pull out from the hoist casing and rub against the casing causing the short. The hoist is estimated to be in use since 1993. There is no way to know if the damage occurred recently or over time, or when the strain relief came loose and the damage occurred. The circuit tripped as designed.

Although the hoist is inspected monthly and the pre-use inspection was performed, these inspections are primarily focused on the load bearing items and not the electrical components and would not likely identify this type of degradation unless the strain relief had come out of the casing between inspections. The worker stated he was doing the pre-use inspection in position below the hoist and did not see the cord had separated until he stepped back several feet. The actual damage to the insulation is difficult to see from the floor.

WHAT CAN WE LEARN

Operations and maintenance should evaluate crane operations and maintenance (especially involving use of manually positioned hoists). Recommendations:

- Consider whether pre-use and preventive maintenance inspections should include visual inspection of pendant and power cords at the hoist.
- Review vendor requirements for hoist inspections (manufacturer's operations and maintenance manual), use of additional strain relief mechanisms, operation and maintenance of crane hoists.

Damage to Canal Parapet during Crane Use

Lessons 2016-0029

At the ATR the 2-Ton main floor crane was being used to remove the Test Train Assembly Station (TTAS) from the canal. During the lift of the TTAS, it became bound/caught on the test assembly storage rack (hereafter referred to as the storage rack), which was used to store the TTAS in the canal. An upward force was applied to the storage rack when the TTAS was being removed and caught an edge which caused three anchors in the top of the storage rack to pull out of the concrete. The three concrete anchors that failed were used to secure the storage rack in place along the top surface of the working section of the canal.

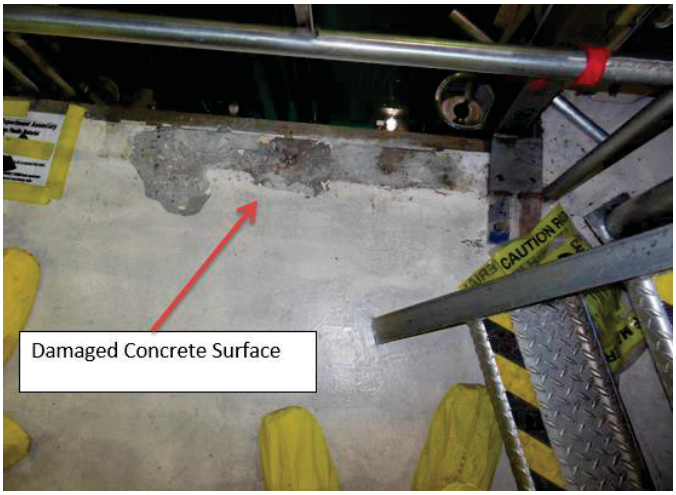
The storage rack is hung from the canal parapet by slots in the back plate of the storage rack which slide over hex-head bolts that are welded to an angle iron on the corner of the parapet. The very top of the storage rack has a plate that sits

flush with the top surface of the parapet. The storage rack is held down by means of three concrete anchors embedded into the concrete, with three hex head bolts screwed into the concrete anchors on the top of the canal parapet.

When the TTAS caught on the storage rack and was lifted, it tore the concrete anchors out of the concrete. Personnel verified that the storage rack was still engaged on the canal wall by visually observing the two hex head/pins were still in the storage rack slots. When tension was relaxed from the rigging arrangement and the TTAS became free from the storage rack, it was moved horizontally away from the storage rack. Further movement of the TTAS was stopped. The storage rack was not being used for fissile material storage at the time of the event.

A plan was developed to remove the TTAS from the canal then place the 2-ton crane out of service pending inspections, stabilize the storage rack using rigging slings and tie off to available structure, move a non-fissile test stored on the storage rack to another location in the canal, and declare the storage rack out of service for inspection and repair.

The storage rack assembly was extensively inspected by ATR Quality Assurance inspectors by means of visual and liquid penetrant examination and no relevant indications or damage was identified. There was no degradation of condition to storage rack assembly. The 2-ton crane was also inspected, and no damage was observed.



ISSUES

This operation had previously been performed under similar work control, but the design engineer, who was typically present during normal work evolutions, was not available. ATR planning contacted the design engineer during planning, and asked if they could use the same work instructions that had been used in the past. The design engineer approved after ensuring it was the same procedure that had been used previously. The document did not contain specific enough instruction for removal of the TTAS without having the design engineer present. The work instructions called for the TTAS to be lifted out in one step. The removal sequence needed specific instructions to lift the TTAS up approximately ½ inch, and then laterally move the TTAS to the east, until it was clear of the storage rack, and then up as necessary to clear the working canal. Trying to perform the removal of the TTAS in one step did not bring attention to the fact that the TTAS could snag on the storage rack; thus, the TTAS caught on the storage rack causing the storage rack anchors to pull out of the floor during this work step.

Another related issue was that the design of the TTAS did not eliminate snag points. The aspect of eliminating snag/catch points during initial design was deemed unnecessary, since frequent removal of the TTAS for inspection was not planned.

WHAT CAN WE LEARN

- Instruction for more complicated lifts should include an illustration of potential snag points.
- It is important to understand that a good design will help ensure catch/snag points are eliminated.
- Ensure that snag/catch points are discussed in the pre-job briefs and how they can be mitigated will help prevent events like this from happening.
- When unfamiliar with the equipment, check the drawings and ensure procedures are adequate for the scope of work, and that prior operating experience has been captured and used. If something is unclear, stop and get clarification before proceeding.

Modified Drill Socket Causes Severe Finger Trauma

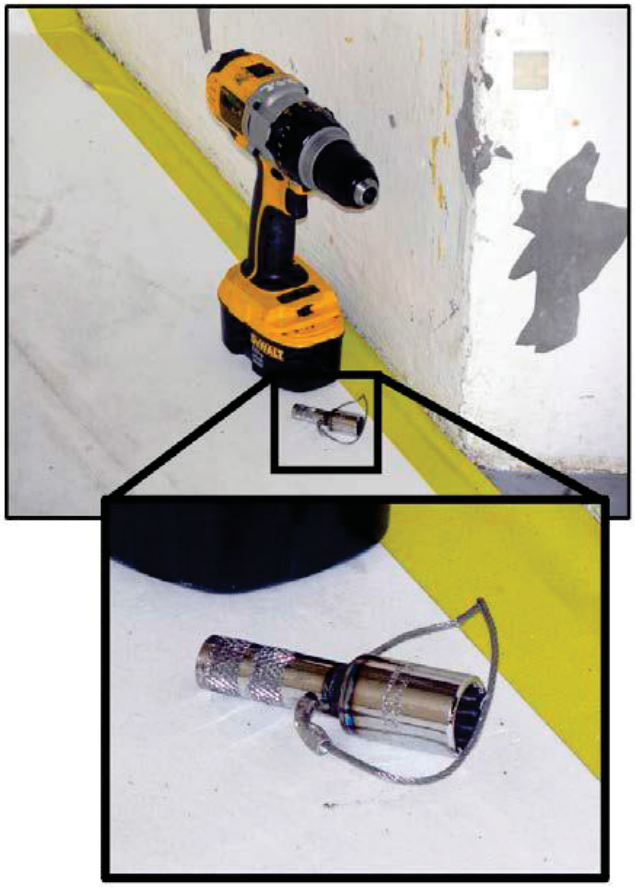
Lessons 2016-0039

On June 6, 2016, a worker at the ATR was injured while conducting maintenance on the South Safety Rod Drive (SRD) package. A cordless 18 volt ½ inch drive drill with an adapter consisting of a shortened extension bar welded to a ½ inch socket was used to operate the SRD Pole Hoist to lower the SRD package to the floor. The adapter had been modified to accept a wire loop lanyard (approximately a 3 inch diameter) through the extension bar shaft. The lanyard was added so the adapter could be hung from the pole hoist in an effort not to lose it. This wire lanyard introduced an entrapment hazard on rotating equipment that was not identified or mitigated.

While operating the drill, the wire lanyard wrapped around the worker's finger causing severe trauma to the middle

finger of the left hand, which resulted in a partial amputation of the finger.

Two of these adapters have been in service since approximately 2010. The preferred method when performing work is to locate the appropriate tool for the job, including purchasing if necessary. When it becomes necessary to develop or modify a tool to solve a situation that arises when conducting a task the employee should ensure that it is evaluated and approved to ensure hazards are fully mitigated.



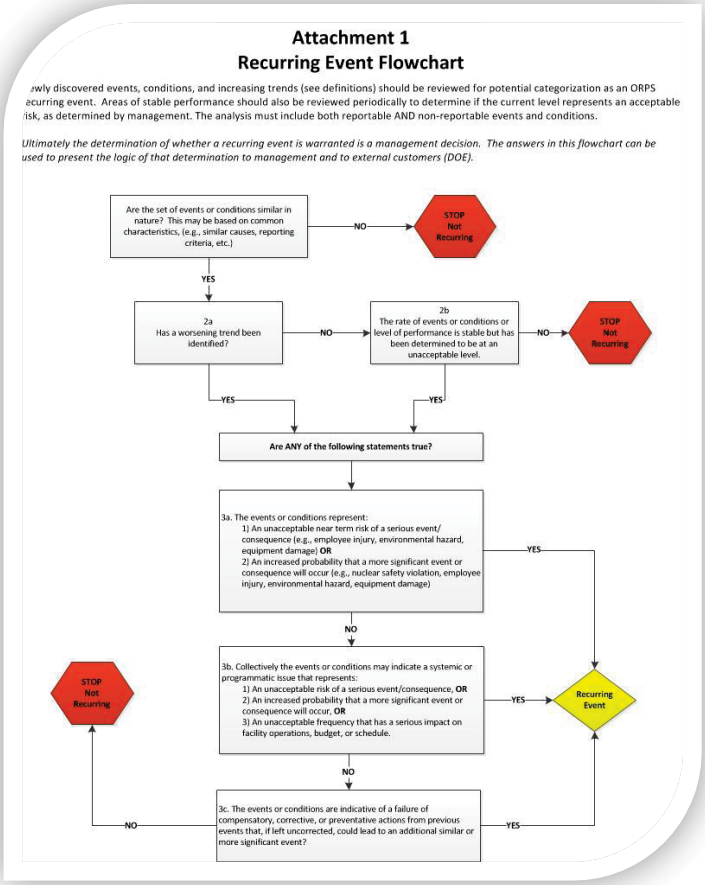
Following the event, ATR Maintenance Management directed that the steel cable lanyards on the SRD Pole Hoist adapters be removed to eliminate the hazard associated with the rotating equipment. As discovered during the critique, Maintenance and Construction personnel have a tendency to modify manufactured tools to meet a usage need during repair or construction work. An example of such a modification would be shortening of an open ended wrench to fit within a restricted area to install or tighten nuts. This practice of modifying equipment and tools should be evaluated at INL to see if other unmitigated hazards have been introduced to the workplace.

Several issues were discovered during the event investigation. These include:

- Management did not ensure the risks and hazards introduced through the modification to the socket were adequately reviewed and assessed. As a result, the hazards were not mitigated in accordance with the hazard mitigation hierarchy contained in LRD-14001, "Occupational Safety and Health Program."
- There are no INL procedures that direct how and when a tool can be modified. As such, tool modifications may not receive the proper review, analysis, and approval, which may result in unmitigated hazards being introduced into the workplace. If the crafts are using standard hand tools to perform work, INL work planners are relying on skill-of-the craft to identify and mitigate hazards, but when tools are fabricated, the modified tools are not necessarily assessed and the hazards associated with them mitigated.
- Many employees identified the impact hazard (being stuck by the wire lanyard as it rotated) but did not recognize the greater entanglement hazard and as such, they failed to take action to remove the hazard. Employees noted that they were aware of the impact hazard and performed their own hazard mitigation by keeping their distance from the lanyard.
- Many personnel recognized the impact hazard associated with the metal lanyard but did not stop work and ensure the hazard was properly mitigated. Although personnel understood the expectation to stop work, it was not acted upon. Personnel interviewed during the investigation process perceived the risk to be less than what was actually present.
- The mechanic stated that they were focused on ensuring the drive assembly was safely lowered to the floor when he "lost situational awareness." This temporary loss of awareness, coupled with the need to simultaneously focus on two critical tasks (lowering the heavy load and operating the drill safely), resulted in not giving enough attention to the position of their hands on the drill when they attached the drill to the hoist hex shaft and actuated the drill trigger.
- The human performance error is coupled with the fact that the work planning process did not recognize the fact that the mechanic would need to divide their attention between these two critical tasks while ensuring they were performed simultaneously and without error

WHAT CAN WE LEARN

- Attention to Detail - Additional attention is needed when working with rotating tools/equipment.
- Hazard Identification - Equipment must be used per manufacturer's instructions and be maintained in a safe condition. When modifications are needed, they must be evaluated, and approved to ensure hazards are fully mitigated.
- Project Planning – Consideration should be given on what tools are required for safe operation of a task. As it was with the pole hoist with the use of any additional adapters to help facilitate the work process.
- Task Preview / Job-site Review – Task preview and job-site review are tools that assist in helping workers consider how their actions affect safety and stimulates dialogue about human performance with others while improving a person's situational awareness. Engaging the mind in each step of the task helps in uncovering hidden hazards that are waiting to cause injury such as a socket with a modified wire lanyard. A similar tool is called "Take two for safety" involves pausing for two minutes to review safety hazards associated with a job.
- Questioning Attitude as it pertains to performing work. There is a tendency to think that simple tools (adapter/drill) are a small risk and do not pose a severe hazard. A small risk coupled with repetitive work can lead to complacency, which can put one unknowingly at a higher level of risk. It is a good practice to pause before we proceed even with the simplest of tasks and ask ourselves what risks are being taken and what could go wrong.
- Questioning attitude as it pertains to modifying tools. Questioning the modification of manufactured tools encourages thought about safety before action is taken. When developing the adapter involved in this incident, the addition of the cable solved the problem of not losing the part. Questions could have been asked on what evaluation may have been needed to ensure the tool was safe to use and that unidentified hazards were not unknowingly introduced.

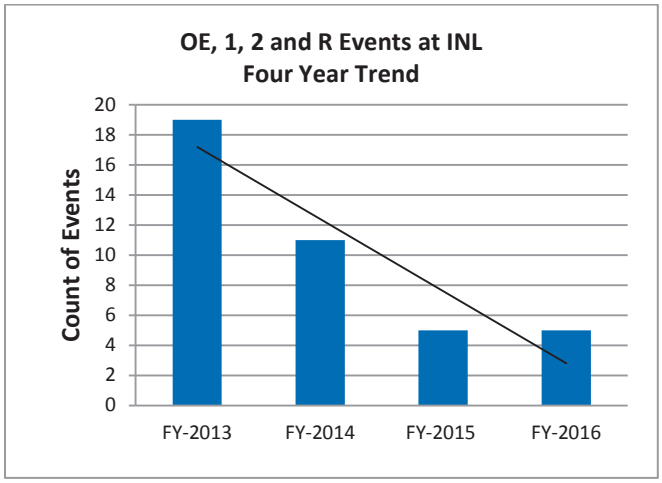


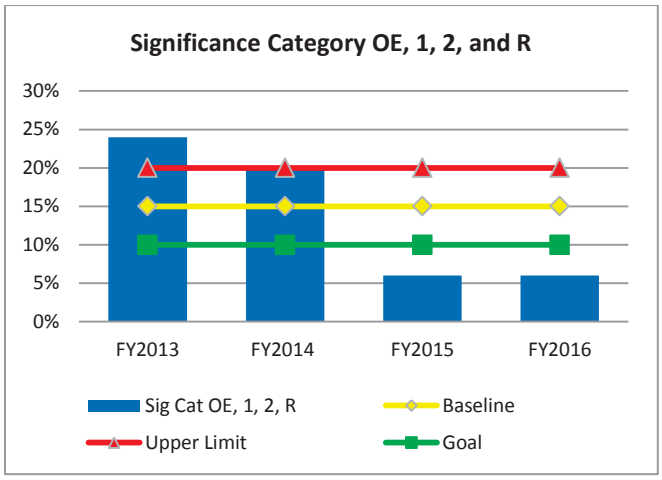
Last quarter, a review of operational performance data identified an increase in the occurrence of events containing an element of Hazardous Energy Control. Those events, binned under a discipline code of "Lockout/Tagout", were used to trend performance since January 2015. In 2015 there were three events reported. Since January 2016 there have been nine events reported and binned under LOTO discipline codes. Four of these contain an element of increased risk to personnel.

Based on this cursory review, a more-detailed analysis of the events was performed. A team, consisting of a qualified cause analyst, representatives from various INL organizations, the INL LOTO subject matter expert, a representative from DOE-ID, and an outside consultant reviewed 13 non-compliances to identify any similarities, and to provide recommendations to the sponsoring organization.

The analysis found that performance of LOTO has shown a marked degradation over the past year, as measured in the number of ORPS reportable occurrences. The team found that the most prevalent theme among all events was less-than-adequate supervisory or management performance of oversight. This was most frequently demonstrated by a Facility Area Supervisor (FAS) approving inadequate LOTOs or failing to adequately supervise the process during work approval or execution. Also noted was the fact that management observations have failed to adequately identify this behavior or to reinforce the expectations of procedural/process compliance. Management has also failed to use focused observations to identify the problem themselves before it rises to a level requiring a common cause analysis.

A team has been assembled to address the findings of the analysis and to develop a corrective action plan. The team will present the plan to the INL Operations Council in November 2016.





INL established a set of performance metrics to monitor events by their significance. The measures compare INL events to those reported at other facilities within the DOE Complex. Baseline data was derived from complex-wide reporting of 5,630 events in the ORPS database between 2009 and August 2014. INL's goal is to experience a downward trend in the number of higher significant events including Significance Category OE, 1, 2, and R occurring at INL. INL's performance metrics are as follows:

Green: Less than 10% of the events reported at INL are OE, Sig Cat, 1, 2, or R; **Yellow**: Greater than 10% and less than 20% of the events reported at INL are OE, Sig Cat 1, 2, or R; and **Red**: Greater than 20% of the events reported at INL are OE, Sig Cat, 1, 2, or R. Control Limits for Significance Category OE, 1, 2, and R events were set at +10% of baseline.

Additionally, INL monitors events by significance category to determine if INL reporting is consistent with reporting at other DOE facilities.

As shown in the chart to the left, INL is experiencing a downward trend in the number of higher significant events occurring at the INL over a four-year period. As with last fiscal year, INL reported five high significant events in FY-16. All five were significance category 2 events; one was the result of a positive USQ concerning loop flow reduction due to loss of commercial power at the ATR and one a criticality safety violation that occurred at the Fuel Conditioning Facility (FCF) when the total fissile mass limit in a fuel bottle container was exceeded. No high significant events were reported in the 4th Qtr FY-16.

During FY-13 and FY-14, INL reported a greater percentage of higher significant events as compared to other DOE facilities (see chart to the left). However, this rate has steadily decreased and INL continues to meet its goal of less than 10% of events reported as highly significant. So far in FY-16, only 6% of all reportable events at INL were of higher significance. This is the same percentage as last fiscal year.

Additionally, 38% of events reported at INL during FY-16 are Significance Category 3. This is below the complex baseline average of 43%. And 57% were Significance Category 4 (higher than the complex baseline of 42%).

Analysis on how INL measures up to the balance of the complex in each of the reporting criteria groups is provided throughout this report.

4th Quarter FY-16 GROUP 1 – OPERATIONAL EMERGENCIES

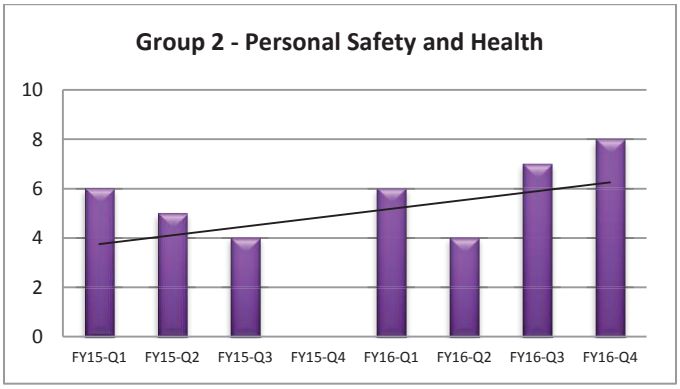
There were no operational emergencies reported during the 4th quarter of FY-16. The last operational emergency at INL was reported in April 2012, when boron triflouride gas leaked from a neutron detector (NE-ID-BEA-INLLABS-2012-0003). The rate of occurrences of operational emergencies continues to trend at zero.

When compared to the balance of the DOE Complex, the rate of occurrence of these types of events at INL is consistent with those reported elsewhere. So far in FY-16, two Operational Emergencies were reported throughout the DOE Complex, equating to less than 1% of the total events reported.

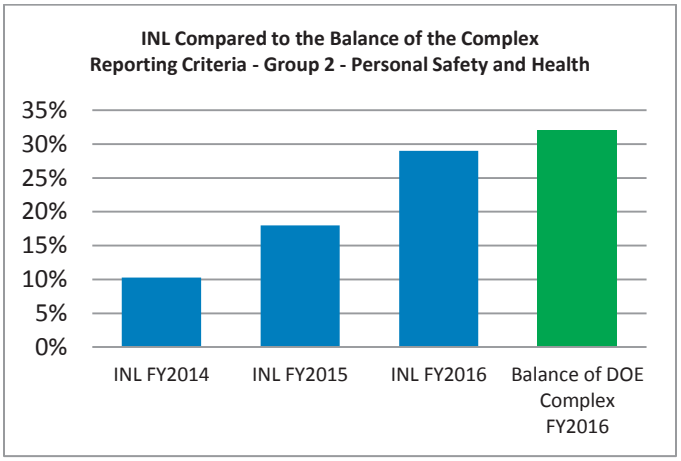
4th Quarter FY-16 GROUP 2 – PERSONNEL SAFETY AND HEALTH

TREND SNAPSHOT

Personnel Safety and Health Events: During the 4th Qtr FY-16, there were eight reportable events related to personnel safety and health (e.g., occupational injuries, occupational exposures, fires, explosions, or hazardous energy). In addition, one event was reported via an INR that did not meet the ORPS thresholds but it was related to criteria in this reporting group. The rate of occurrence of reportable personnel safety and health events is trending upwards over the last two years.



When compared to the balance of the DOE Complex, the rate of occurrence of Group 2 events at INL was slightly lower than that reported elsewhere in the complex during FY-16. INL reported 29% of events in this reporting group and the balance of the complex 32%. INL saw a slight increase in the occurrence of Group 2 events during this quarter (seven events reported last quarter compared to eight this quarter).



The events (reportable and non- reportable) during the 4th Qtr FY-16 are summarized below:

Hazardous Energy Control Process Not Followed
NE-ID--BEA-CFA-2016-0004 (Significance Category 3)
Site-wide Facilities and Operations Management was notified that a construction subcontractor installing a WiFi system in building CFA-696 did not have "other than electrical hazardous energy controls" in place to prevent the movement of the overhead bridge crane while work was being performed. The potential safety significance of the event was low as the bridge crane was not in use at the time work was performed.

The investigation found that the subcontracted workers disregarded a job superintendent's direction to not work in the area housing the overhead crane. Instead of following work direction, the workers chose to perform the work prior to moving their equipment to another area of the building. The work direction violations occurred in part because the superintendent did not properly communicate the hazards associated with working in the area because he was not familiar with the hazards present in the area and the

superintendent was recently placed in a position of authority over persons who were recently his peers. This oversight change led to unforeseen conflicts between the superintendent and the employees.

What We Can Learn: This issue shows the importance of thoroughly ensuring that we provide the right level of training, and assistance to work superintendents to enable them to perform their job effectively. In this event the superintendent did not understand the hazards associated with working in the area and was also not provided an opportunity to obtain the knowledge and skills necessary to perform the job of a superintendent. This level of knowledge and competence could have been achieved by providing additional time for the superintendent to work under a seasoned superintendent.

Inadequate Identification of Hazardous Energy

NE-ID--BEA-MFC-2016-0009 (Significance Category 3)

A LOTO and a zero-energy check were performed July 7, 2016 on an electrical circuit for a swamp cooler located at MFC-768, in preparation for the cooler replacement. The power cable to the unit was disconnected and wire nuts were installed on the conductors. The swamp cooler was then replaced. Due to an unforeseen delay, maintenance was suspended and then was resumed on July 27, 2016. While performing safe to work checks, the electricians discovered that the circuit was energized. The area was barricaded and notifications made.

Upon investigation, it was discovered that the incorrect breaker had been tagged out and the zero-energy check performed on July 7, 2016 had been done in the wrong location in the circuit.

An investigation into the event found that the Utility and Infrastructure Support (UIS) operations specialists and the electrician placed their locks in the wrong location. The situation present in the field resulted in their error. Specifically, the breaker panel directory, switching systems, and the evaporative coolers were not consistently labeled with properly identified markings.

The investigation also found that the zero-energy check was conducted at the point of disconnect where the electrician planned to remove the electrical leads and isolate the evaporative cooler. The electrician did not realize his lock was on the wrong breaker, nor did the electrician identify a contactor that was located between the breaker panel and the point of disconnect, which was causing his meter to show no electrical energy on the circuit. Finally, the controls that needed to be locked and tagged out were not of the same configuration as other coolers in the facility.

What We Can Learn:

- Roundtable reviews (required at MFC) are an effective tool in identifying correct energy isolation boundaries and the location/method for performing zero-energy checks.
- Careful consideration should be taken before using the same person to prepare, authorize, and place a LOTO. This practice prevents a second set of eyes from looking at the isolation boundaries.
- Use a self-check tool, such as Stop, Think, Act, and Review, when performing tasks. Had this been done, the electrician may have noticed that a single-pole breaker had been tagged out on a three-pole disconnect switch.
- Panel directories should be reviewed and updated so they are clear and accurate in identifying equipment and breaker numbers.

Broken Electrical Cable in the Remote Handled Low Level Waste Communication Trench

NE-ID--BEA-MFC-2016-0010 (Significance Category 3)

On August 29, 2016 a 120 volt direct buried electrical cable was discovered during excavation activities. A construction excavator operator was excavating a communication trench in support of the Remote Handled Low Level Waste (RH-LLW) project, on the south side of the outer perimeter road, outside of the south west corner of the ATR complex. As the operator was excavating, he noticed a cable had been pulled up from the ground. The gray cable appeared to be

Romex® and was found approximately 24 inches deep. Electrical energy to the National Oceanic and Atmospheric Administration (NOAA) weather station was impacted as a result of the event.

The cable looks to have been broken during excavation activities. An initial investigation into the event found there was no detailed subsurface investigation performed in this area prior to excavation. No personnel were exposed to an energized electrical hazard.

What We Can Learn:
The investigation into this event is still ongoing. Lessons learned from the event will be shared next quarter.

Lockout Tagout Isolation Device Inadvertently Falls Off Breaker

NE-ID--BEA-MFC-2016-0012 (Significance Category 4)
On September 15, 2016, a LOTO device that had previously been installed and peer checked for proper installation was found on the floor underneath an electrical panel in MFC-752. The person who discovered the LOTO device secured the area, and initiated notifications.

Maintenance workers performing preventive maintenance on a heating, ventilation, and air conditioning (HVAC) unit in the area had just completed their work. The workers determined that the LOTO device was associated with their work.

What We Can Learn:
An investigation into the event found that the device was not defective but it had likely been installed incorrectly. Workers should always check the integrity and installation of installed locking devices to ensure they will perform as designed.

Personnel Did Not Have Required LOTO Escort Training

NE-ID--BEA-SMC-2016-0002 (Significance Category 4)
During the course of performing oversight of a LOTO, a manager at the Specific Manufacturing Capability (SMC) facility determined that on two occasions during the last month, two individuals had been escorted to perform work under a LOTO but had not taken the required on-line training. This training was implemented at INL in May 2016 to fulfill an Occupational Safety and Health Administration (OSHA) Code of Federal Regulations (CFR) requirement. The manager's initial investigation found one instance, after which SMC performed a 100 percent review of records. This resulted in the discovery of the second instance. Both individuals had been briefed and were escorted for the work as required, but not having the required training violated the LOTO procedure as well as the relevant section on the CFR.

What We Can Learn:
An investigation into this event found that an increase in work load of the FAS likely contributed to the event. Ensuring that we maintain a healthy attitude of "attention-to-detail" when work responsibilities increase will help prevent administrative errors like this from happening. Likewise, upper management must be sensitive to increased workloads for Foremen and Supervisors and how the increase can affect their performance.

Failure to Establish Exclusive Control of Other Hazardous Energy While Performing Electrical Zero Energy Verification

NE-ID--BEA-SMC-2016-0003 (Significance Category 4)
During an independent review of a Complex LOTO, management at the SMC facility at the INL, determined that a standard SMC practice had not been followed, and that this failure resulted in a violation of a required element of the LOTO program.

This practice allows electricians to establish exclusive control of a mechanical motion hazard while they perform electrical zero-energy verifications in cases where both hazards are present and where the electrical zero-energy verification is performed where the electricians may be exposed to the motion hazard.

In this event, SMC had established a complex LOTO to replace overhead light fixtures that were within the movement boundary of an overhead crane. The LOTO required performance of zero-energy verifications at the light fixtures as well as performing an operational try to verify absence of the motion hazard of the crane. The crane was de-energized and locked out, but the zero-energy verification for the mechanical movement had not been completed and electricians had not applied their personal locks and tags to establish exclusive control over the crane movement hazard while they performed their electrical zero-energy verification within the crane boundary.

Verification of the absence of hazardous energy and establishment of exclusive control over the re-introduction of energy are required elements of the OSHA LOTO regulation. SMC has an established practice for these situations that would have allowed the electricians to be protected and to apply exclusive control, but it was not followed in this event. Successful completion of all zero-energy verifications (electrical and mechanical) showed that there was no actual exposure to an uncontrolled hazardous energy source.

What We Can Learn:
When planning work, and especially work involving hazards, we must ensure that persons performing the work understand the sequencing of activities. Proper sequencing of work activities can ensure personnel perform work in a safe manner.

Personal Key Left Unattended Next to Lockout Tagout Lock Box

NE-ID--BEA-STC-2016-0005 (Significance Category 4)
A Research and Education Campus (REC) Research Lab Space Coordinator (LSC) discovered a research subcontract employee working under the INL LOTO escort provision had left their personal lock box key on the table next to the job lock box when he left at the end of the day on August 11, 2016. The lock box still had his lock and the job lock on the lock box.

What We Can Learn:
Oftentimes, subcontract personnel working at INL are not accustomed to the added rigor of our hazardous energy control program. When working with subcontract personnel consider additional controls or oversight to ensure they understand their responsibilities and are performing work in accordance to INL procedures.

Employee Fall Results in Fracture

NE-ID--BEA-STC-2016-0007 (Significance Category 3)
On September 20, 2016 a Business Management employee was descending stairs in the Center for Advanced Energy Studies (CAES) auditorium, lost her footing and fell. The employee was immediately transported by private vehicle to the Willow Creek (WCB) Dispensary. Due to unavailability of services at the WCB Dispensary the employee was referred by CFA Dispensary to a Community Care facility. At Community Care the foot was X-rayed and the employee was told it was not broken, only a bad sprain.

On the morning of September 21, 2016 the employee followed up with the WCB Dispensary, where they examined the employee. The employee was released to return to work with restrictions. The employee had a scheduled re-evaluation at the WCB Dispensary on the morning of September 26, 2016. During the re-evaluation visit, an X-ray was performed and the employee was told that a bone fracture was present. The WCB Dispensary referred the employee to an off-site orthopedic specialist.

What We Can Learn:
Slips, trips, and falls can happen anywhere and people must maintain situational awareness whether they are on an icy surface or ascending/descending staircases.

Other Non-Reportable Events

There was one additional non-reportable event related to safety and health problems documented in LabWay during the 4th Qtr FY-16.

CO 2016-2239
A fabrication technician was performing pre-use inspections on a lifting hoist in MFC-789 when the feeder breaker tripped. He observed the 120-volt power cable to the hoist had partially detached. Facility management was notified and the power cable plug was removed. Further investigation found the power cord had rubbed against the hoist casing exposing the conductor. Personnel were not immediately exposed hazardous energy due to the hoist location being ten feet above the floor. The lessons learned from this event have been included in the Lessons Learned section of this report.

ANALYSIS FOR RECURRING EVENTS:
Personnel Safety and Health occurrences have been one of the most frequently reported event type this fiscal year, and have also accounted for 22 reportable and 13 non-reportable events in the past 12 months. During this quarter, six of the eight events were related to control of hazardous energy. This trend had been identified and an evaluation of the events was performed. A corrective action plan will be developed to address the results of the analysis.

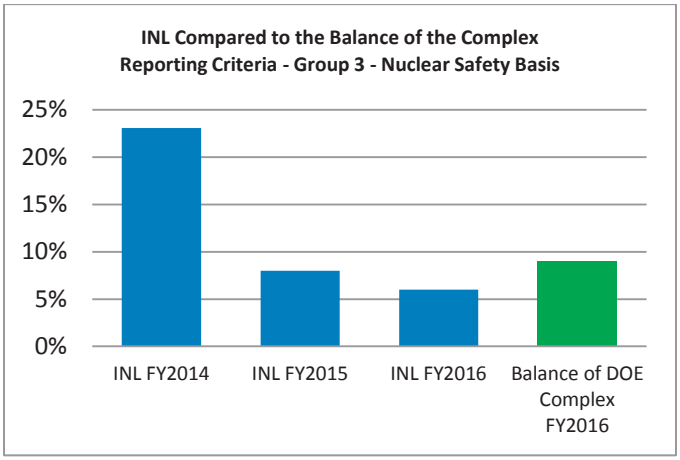
Also, in the past 12 months, five reportable events were the result of slips, trips, and falls. A review of these injuries found no commonalities that would warrant identification as a recurring problem.

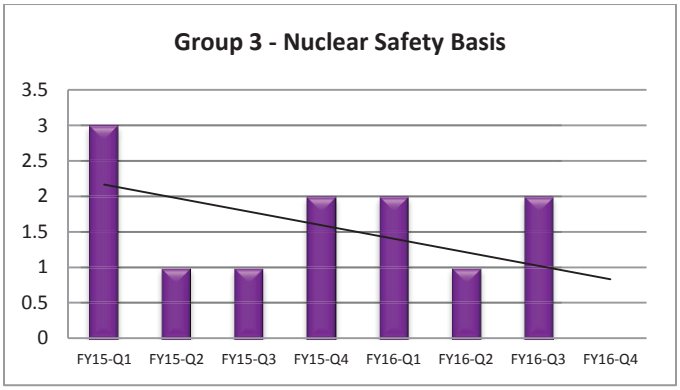
Finally, analysis of the 13 non-reportable events that occurred in the past year found no recurring themes or problem of a similar nature.

TREND SNAPSHOT

Nuclear Safety Basis Events: There were no nuclear safety basis events reported in the 4th Qtr FY-16. The rate of occurrence of nuclear safety basis events continues to tend downward over the past two years. During the past 12 months, five events have been reported under this criteria; one was identifed at ATR and four at MFC facilities. **An analysis of the events did not reveal any commonalities that would indicate a recurring trend or recurring events.**

When compared to the balance of the DOE Complex, INL has reported a lower percentage of events under the Group 3 - Nuclear Safety Basis criteria than the rest of the complex. In FY-16, 6% of INL's events and 9% of the balance of the DOE Complex events were reported under Nuclear Safety Basis criteria.





The number of INL events reported under these criteria continues to trend downward over the last two years. In the 4th Qtr FY-16, no Nuclear Safety Basis events were reported.

Other Non-Reportable Events

There were no additional non-reportable events related to nuclear safety basis problems documented in LabWay during the 4th Qtr FY-16.

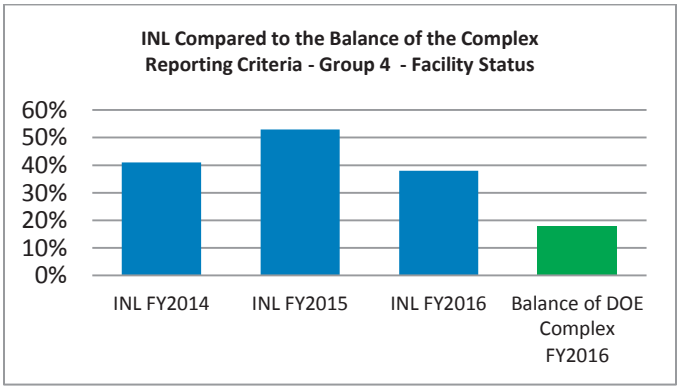
ANALYSIS FOR RECURRING EVENTS:

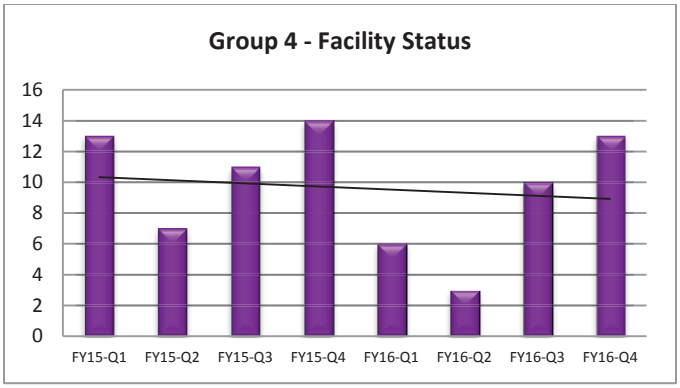
Analysis of the five events reported under the nuclear safety basis criteria over the past year revealed no commonalities or recurring themes: declaration of a positive USQ; determination of a negative USQ; violation of a credited hazard control in a Hazard Category 1, 2, or 3 Nuclear Facility; missing a surveillance test; and the declaration of a PISA.

TREND SNAPSHOT

Facility Status Events: Facility status events account for nearly 38% of the events reported in FY-16. The number of events reported under this criteria increased from last quarter (10 to 13). The rate of occurrence of facility status events is trending slightly downward over the past two years. Twelve of the 13 events this quarter occurred at ATR and one at SMC. All of the ATR events were related to performance degradation of Safety Class (SC) or Safety Significant (SS) Structure System or Component (SSC). Thirty-five events have been reported at INL under the Group 4 reporting criteria over the past 12 months; 32 of which occurred at ATR.

The percentage of occurrence of Group 4 – Facility Status events at INL is higher than that of the balance of the DOE Complex (38% at INL versus 18% throughout the complex). Sixty-nine percent of the Group 4 events in the past 12 months have been reported as performance degradation of a safety class SC SSC when it was **not** required to be in service; all of which occurred at ATR. These events are anticipated and have occurred during reactor shutdown with most occurring during testing of equipment for restart.





The 13 events reported under the Group 4 – Facility Status criteria during the 4th Qtr FY-16, are summarized below.

ATR 674-M-6 Emergency Diesel Generator High Water Temperature Shutdown Alarm

NE-ID--BEA-ATR-2016-0020 (Significance Category 4)
On July 4, 2016, a 674-M-6 Emergency Diesel Generator (EDG) high water temperature shutdown alarm was received in the ATR reactor control room. The M-6 EDG was not running at the time and the jacket water temperature was reading normal at 120°C.

The M-6 EDG was taken out of service. At the time the alarm was received, the ATR was shut down for the Cycle 160A-1 scheduled outage and the M-6 EDG was not required to be operable per Technical Safety Requirements (TSR)-186.

Advanced Test Reactor Critical Manual SCRAM Due to Abnormal Indication on Log N/Period Channel B

NE-ID--BEA-ATR-2016-0021 (Significance Category 3)
The Advanced Test Reactor Critical (ATRC) reactor was shut down by manual SCRAM in response to a failure of the Log N/Period Channel B instrument. A normal reactor startup was in progress using Operating Procedure (OP)-1.2, ATRC Startup. After commencing Outer Shim Control Cylinders withdrawal, the reactor operator did not observe the expected period response on the Log N/Period B recorder and stopped the outer shim withdrawal. The reactor supervisor directed a manual SCRAM in response to the failure. The reactor had not yet achieved criticality prior to the failure and SCRAM.

The ATRC was shut down prior to reaching any limits and at no time did an unsafe condition exist.

Advanced Test Reactor Diesel Generator Failure

NE-ID--BEA-ATR-2016-0024 (Significance Category 4)

The ATR 786-M-1 diesel generator was found to be displaying several out of specification indications, some of which were determined to be erroneous. Initial indications are that there is a failure in the control system for the diesel. Diesel generator 786-M-1 supplies power to the #3 Deepwell and is required to be operable when the ATR reactor is fueled. ATR was in a scheduled outage and was defueled at the time of discovery.

Confinement Isolation Damper BDM-1 Failed at the Advanced Test Reactor

NE-ID--BEA-ATR-2016-0026 (Significance Category 4)

While performing functional checks of the ATR confinement system, isolation damper BDM-1 failed to close when the Radiation Monitoring and Seal System was actuated for the test. The functional testing procedure was exited, and a maintenance request was initiated. The confinement isolation system is required to be operable during power operation and for 30 minutes following; however, ATR was in a maintenance shutdown at the time of discovery and the confinement isolation system was not required to be operable.

Advanced Test Reactor Lobe Power Calculating and Indicating System Inoperable

NE-ID--BEA-ATR-2016-0027 (Significance Category 4)

On September 1, 2016, the ATR shift supervisor was notified by the Reactor Data Acquisition System (RDAS) system engineer that the engineer had discovered several wires with degraded insulation due to aging in the RDAS Analog Data Acquisition System cabinet. The degraded wires are low voltage signal wires affecting the N-16 system signal to the RDAS. The Lobe Power Calculating and Indicating System (LPCIS) was declared inoperable.

The LPCIS is required to be operable when the ATR is in power operation; however, ATR was in a maintenance shutdown at the time of discovery and the LPCIS was not required to be operable.

Failed Comparators in Advanced Test Reactor Emergency Firewater Injection System

NE-ID--BEA-ATR-2016-0028 (Significance Category 4)

An ATR Reactor Instrument and Controls Technician (RICT) reported to the ATR Control Room Supervisor that during investigation of Emergency Firewater Injection System (EFIS) alarms, they determined the cause to be a failed comparator in either the upper vessel EFIS, or the bottom head EFIS. The alarm is common between upper vessel and bottom head. Due to circuit construction there is no way to narrow the failure with certainty to either the upper vessel or bottom head EFIS without replacement of components. Channel B upper vessel and bottom head EFIS were declared inoperable and their respective 2/3 modules were manually tripped.

The EFIS is required to be operable when the vessel contains irradiated fuel elements or fueled experiments that have not yet met their required cooling time; however, at the time of discovery, the reactor vessel did not contain irradiated fuel elements or fueled experiments that had not met required cooling time.

Other Non-Reportable Events

There were nine additional non-reportable event related to facility status reported during the 4th Qtr FY-16.

CO-2016-1131

On April 19, 2016, the ATR control room received an Automatic Voice Announcement System (AVAS) notification of a fire department response and a water flow alarm in building TRA-634. Facility Incident Response Team (IRT) personnel responded to building TRA-634 to assist the fire department. No evidence of water flow or of fire was detected in building TRA-634. The fire suppression system in TRA-634 is a dry-pipe system. The building fire suppression system piping is maintained dry by an automatic valve controlled by air pressure within the piping. The air

compressor that maintains the system supply valve in a shut position had failed. The cause of the water flow alarm was determined to be the opening of the supply control valve with subsequent filling of the piping system within the building.

Advanced Test Reactor Confinement Door-202 Latch Failure

NE-ID--BEA-ATR-2016-0029 (Significance Category 4)
On September 7, 2016, an ATR Shift Supervisor received a report from the Reactor Auxiliary Operator that during confinement door surveillance checks, Door 202 (D-202), the 40-ton crane emergency exit door leading out of the ATR confinement area, would not latch without operator intervention. The ATR shift supervisor declared the confinement function of D-202 inoperable. The ATR was in a planned maintenance outage at the time of failure and the confinement system was not required to be operable.

Advanced Test Reactor North West N-16 Flow Indication Failure

NE-ID--BEA-ATR-2016-0030 (Significance Category 4)
An ATR shift supervisor received a report from the Reactor Auxiliary Operator that inlet flow on the northwest (NW) N-16 chamber was low out of the required band and could not be adjusted due to a suspected inlet valve failure. Investigation revealed no failure of the inlet valve, but did identify a failure of the NW chamber flow indicating system. The N-16 system is the input to the ATR LPCIS and is required to be operable during reactor operation. The LPCIS had previously been declared inoperable for another unrelated issue. ATR was in a planned maintenance outage at the time of failure and the LPCIS was not required to be operable.

Advanced Test Reactor Plant Protective System Logic Module Failures

NE-ID--BEA-ATR-2016-0031 (Significance Category 4)
On September 8, 2016, an ATR Plant Foreman discovered the Outlet Temperature and Quadrant Differential Temperature 2:3 logic modules in Plant Protective System (PPS) Room "A" were indicating a tripped condition, yet there was no trip indicated on the associated upstream comparators as would be expected from the indications on the logic modules. It was determined that a failure of the logic modules had occurred for unknown reasons. ATR was in a planned maintenance outage at the time of failure and the affected channels were not required to be operable.

Reactor Instrument and Controls technicians were requested to troubleshoot and repair. The troubleshooting efforts identified the failure of PPS Room "B" 2:3 logic modules, as well as Room "A" logic modules.

Advanced Test Reactor Quadrant 1 Differential Pressure Instrument Failure

NE-ID--BEA-ATR-2016-0032 (Significance Category 4)
The ATR Control Room received a Quadrant 1 Differential Pressure Low alarm. Investigation of the alarm indicated a probable failure of Quadrant 1 Differential Pressure Transmitter (DPT)-1-21. ATR was in a planned maintenance outage at the time of failure and differential pressure instruments were not required to be operable.

An engineering evaluation and calibration were performed and determined that DPT-1-21 was operable, but experiencing age-related degradation. As a preventative maintenance measure, plans have been put in place to replace differential pressure transmitters in all four reactor quadrants with latest generation hardware.

Upper Firewater Valve GT-1-614 Position Alarm at the Advanced Test Reactor

NE-ID--BEA-ATR-2016-0033 (Significance Category 3)
On September 22, 2016, an alarm was received in the ATR Reactor Control Room for Upper Firewater valves GT-10-63 and GT-1-614 position abnormal. The alarm alerts operators to a potential valve miss positioning of one or both supply valves in the upper firewater injection system. ATR TSR-186, Limiting Condition for Operation (LCO)-3.2.1.2, requires both upper and lower firewater flow paths to be operable in the present plant conditions. ATR was in power operation for Cycle 160A-1 at the time of discovery.

Operators immediately confirmed that the two valves were locked open and firewater pressure was present as indicated on a local gauge per the alarm response procedure. The flow path for firewater to the reactor vessel was not affected since the two valves were in the required position for the plant conditions and locked open. Cause of the alarm was determined to be a malfunctioning limit switch in valve GT-1-614. An investigation into the failure is ongoing.

Advanced Test Reactor Critical Facility Manual SCRAM Due to Abnormal Indication on Log Count Rate Meter Recorder

NE-ID--BEA-ATR-2016-0034 (Significance Category 3)
On September 29, 2016, the ATRC was shut down by manual SCRAM in response to abnormal indication on Log Count Rate Meter (LCRM) Recorder Channel B. A normal reactor startup was in progress using OP-1.2, “ATRC Startup” procedure. During safety rod withdrawal, LCRM Recorder Channel B

indication appeared to stick at 25 counts per second (cps). All other LCRM Channel B instrument indications were as expected. The recorder was opened to check the slide wire. When the recorder was shut the pen freed and began indicating as expected. After consultation with the reactor manager, the Reactor Supervisor directed a reactor shutdown by manual SCRAM.

An investigation into the event found the apparent cause to be an end of life failure of the equipment. The reactor control boards are original equipment and have been in operation since 1964.

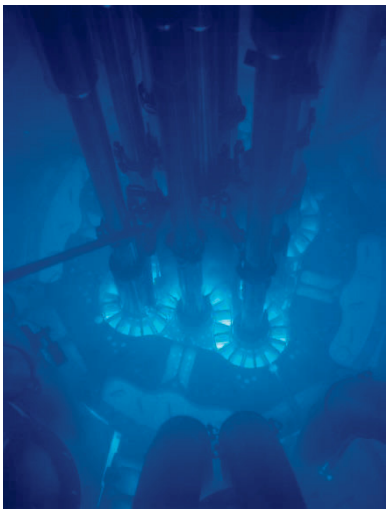
Loss of Immediate Facility or Offsite Emergency Response Capabilities

NE-ID--BEA-SMC-2016-0001 (Significance Category 1)
An Uninterruptable Power Supply (UPS) system failed to transfer during a circuit 52 unscheduled power outage, causing loss of power to the SMC telephone system. The SMC Shift Supervisor entered into Abnormal Operation Procedure SMC-AOP-017, Response to Loss of Telephone Communications at SMC. There was no emergency condition at SMC but during the period that the phone service was interrupted until the condition was discovered and compensatory actions taken, SMC was without immediate emergency response capability.

Other Non-Reportable Events

There were no additional non-reportable events related to facility status problems reported during the 4th Qtr FY-16.

ANALYSIS FOR RECURRING EVENTS:
A review of the 33 Facility Status occurrences that were reported in the last 12 months was performed. There were three events reported related to diesel generators at ATR and four events related to ATR confinement doors. There were no similarities noted in these events that would indicate they are recurring.



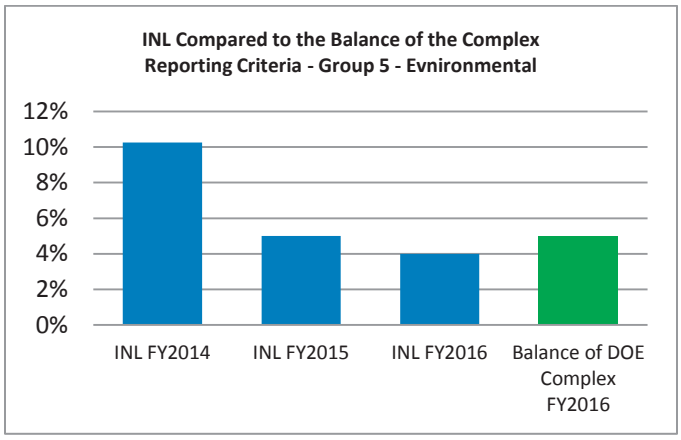
Twenty seven of the events in the past 12 months were the result of degradation of a safety class or safety significant component; 22 of these occurred when the component was not required to be operable. All were discovered at ATR, primarily during preparation for reactor restart. Many of the events occurred because frequent foot traffic to the facility caused degradation of door seals and latches.

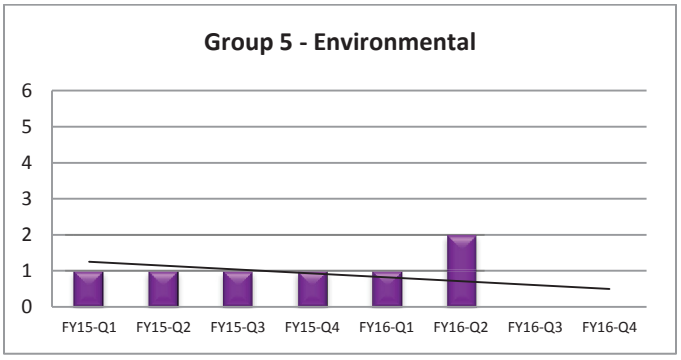
Two events this quarter resulted in a SCRAM of the ATRC. A review of these events did not identify them to be recurring but related to old equipment that is reaching its end-of-life expectance. ATRC management has identified the problem and has implemented the ATRC Control System Refurbishment project. This is an approved funded project in accordance with the "Advanced Test Reactor Five-Year Plant Health Investment Strategy." This activity will replace the existing ATRC facility instrument and control system with a system designed to modern day requirements and incorporating modern capabilities, such as self-testing features. The system will be fabricated from commercial off-the-shelf (COTS) parts that are expected to remain available for the foreseeable future. Per the ATRC Integrated Strategic Operational Plan (ISOP), this upgrade is scheduled to complete in October 2019.

TREND SNAPSHOT

Environmental Events: There were no environmental releases reported under the Group 5 reporting critieria in the 4th Qtr FY-16. The rate occurrence of environmental events over the past two years is trending downward.

When compared to the balance of the DOE Complex, the percentage of occurrence of Group 5, environmental events reported at INL is slightly lower (4% compared to 5% during FY-16). Aside from three events that have occurred this fiscal year, all of environmental events reported during the last two years have been related to 40 Code of Federal Regulations (CFR) Part 63, Subpart ZZZZ (also known as Quad Z) requirement changes.





Other Non-Reportable Events

There were no additional non-reportable events related to environmental problems reported during the 4th Qtr FY-16.

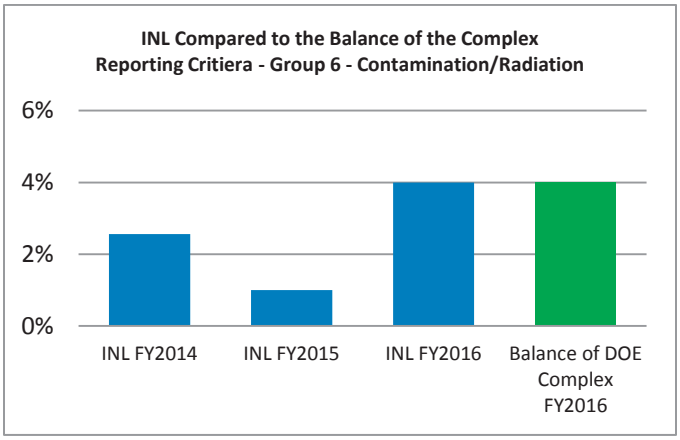
ANALYSIS FOR RECURRING EVENTS:

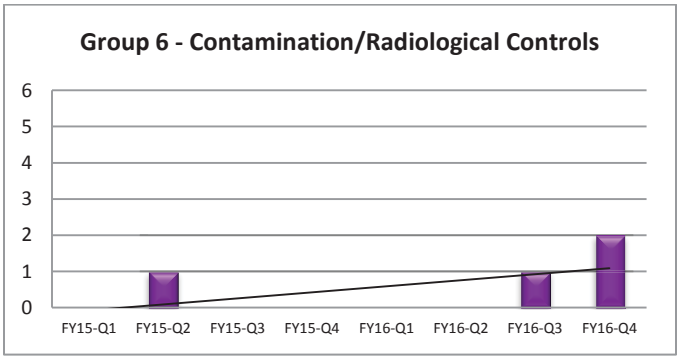
Three events have been reported under the Group 5 reporting criteria during the last 12 months. All were related to diesel fuel oil spills. One occurred at CFA and was reported in the 1st Qtr FY-16. Two occurred at ATR and were reported in the 2nd Qtr FY-16. There were no commonalities in the spills that would warrant them being reported as recurring.

TREND SNAPSHOT

Contamination/Radiation Events: There were two reportable event related to contamination/radiation control reported in the 4th Qtr FY-16. Both events occurred at the Fuel Conditioning Facility and resulted in personnel or clothing contamination. The rate of these types of events is trending slightly updards over the past two years. There was also one non-reportable event reported this quarter.

Two events reported at INL during the 4th Qtr FY-16 were reported under Group 6 Contamination/Radiation criteria. Both INL and the balance of the DOE Complex has reported 4% of events under this criteria during FY-16. Events related to contamination and/or radiation control are some of the least reported event types at INL. These have only accounted for three events at INL in the last 12 months.





Personnel Clothing Contamination

NE-ID--BEA-FCF-2016-0001 (Significance Category 4)

On August 10, 2016 during the exit of the Suited Entry Repair Area (SERA) at the Fuel Conditioning Facility (FCF), contamination was found on an individual. The levels were found to be 4.2 Million disintegrations per minute (DPM) beta/gamma with no alpha contamination detected.

What We Can Learn:

An investigation into this event is ongoing and lessons will be shared next quarter. However the fact finding speculated that the worker likely degraded their outer layer of personal protective equipment (PPE). The degradation in conjunction with perspiration allowed contamination to permeate the PPE. Taking measures to prevent degradation of PPE can help reduce the risk of contamination wicking.

Personnel Clothing Contamination

NE-ID--BEA-FCF-2016-0002 (Significance Category 4)

On August 24, 2016 an INL employee was removing waste from the FCF. During their exit through the North stairwell, contamination was discovered on the employee's bottom left shoe and pants leg. The articles of clothing were removed and the individual frisked clean through a Personal Contamination Monitor (PCM). It was later found that the individual's clothing had become contaminated during handling of waste bags stored in the truck lock Radiological Material Area (RMA). The levels found on the individual's clothing were up to 410,000 DPM beta/gamma with no alpha contamination detected.

Other Non-Reportable Events

There was one additional non-reportable event related to radiation/contamination reported during the 4th Qtr FY-16.

CO-2016-2459

During an exit from the tank room located in the FCF, a technician inadvertently removed final shoe covers from his feet and placed both feet back on the sticky pad located inside the High Rad Area and High Contamination Area (HRA/HCA) instead of stepping into the RBA. In doing so, the technician contaminated the bottom of both shoes at levels of 3000 – 5000 DPM per probe area beta/gamma, with no detectable alpha contamination.

The technician's shoes were removed and bagged as waste, and the technician was surveyed with no further contamination detected. A Radiological Work Permit (RWP) violation occurred based on the removal of protective clothing and the individual remaining in the HCA/HRA without the required PPE. Additionally, the RWP used to perform the activity was rated for low hazard versus the required moderate hazard for whole body entry into a HCA, which is a violation of the ALARA Program and Implementation procedure.

What We Can Learn:

Even the most routine tasks can be performed in error. Oftentimes, when we are working in a skill-based mode (i.e., performing routine actions in a familiar situation), errors can occur due to inattention to detail. Taking the time to stop and review the actions you are about to take, can move you from a programmed response to a conscious, thought-out response.

ANALYSIS FOR RECURRING EVENTS:

Aside from the two events reported this quarter, there has only been one additional reportable event under the Radiation/Contamination reporting criteria the past 12 months and eight non-reportable events including the one reported this quarter. A review of these eight events identified no commonalities, no adverse trends, and no recurring problems.

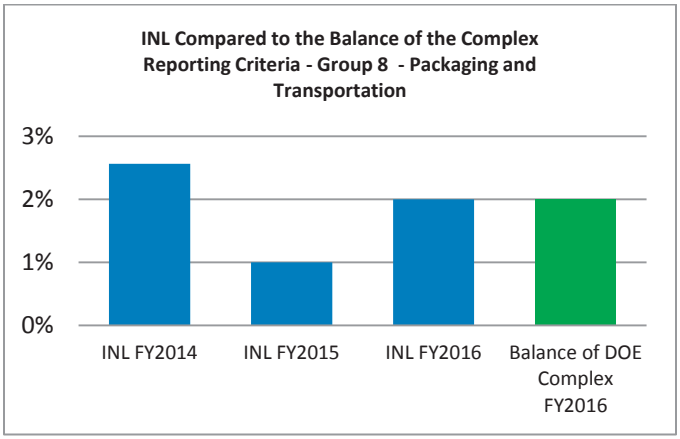
4th Quarter FY-16 GROUP 7 – NUCLEAR EXPLOSIVE SAFETY EVENTS

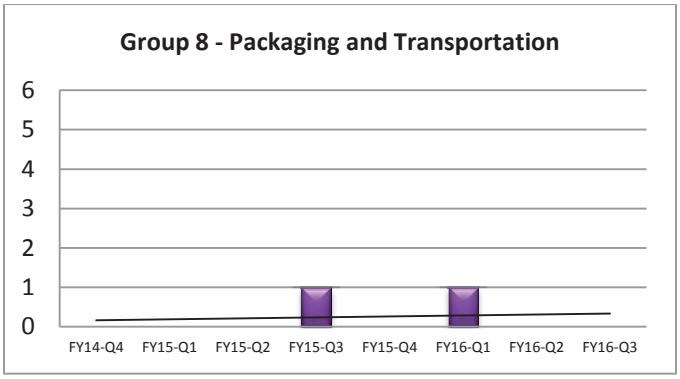
There were no events related to nuclear explosive safety during the 4th quarter FY-16. BEA has never reported an event under this reporting criteria since taking over the contract for the Laboratory in 2005. There was only one event reported under the Group 7 – Nuclear Explosive Safety Events criteria in the balance of the DOE Complex during FY-16.

TREND SNAPSHOT

Packaging and Transportation Events: One reportable Packaging and Transportation (P&T) event was reported during the 4th Qtr FY-16. The rate of occurrence of P&T issues is trending slightly upward due two events in the last 12 months. There were no additional non reportable events during the 4th Qtr FY-16.

INL rarely reports events under Group 8 Packaging and Transportation criteria. When compared to the balance of the DOE Complex, INL is reporting the same percentage of events in this reporting group (approximately 2%).





The one reportable event this quarter is as follows:

Radioactive Material Shipped in a Nuclear Regulatory Commission Noncompliant Configuration

NE-ID--BEA-STC-2016-0003 (Significance Category 3)
On August 18, 2016, Mission Support Services Logistics Services management was notified that fasteners used for the closure of the Cobalt 60 shielded insert used for radioactive material shipments in the 10-160B cask were not in conformance with the NRC Certificate of Compliance (CofC).

The NRC CofC specifies that fasteners for this insert be manufactured domestically; however, fasteners procured by Los Alamos National Laboratory (LANL) and supplied by Energy Solutions to the Offsite Source Recovery Program (OSRP) were of foreign manufacture. A commercial grade dedication was performed on the fasteners by the manufacturer. It was determined in the evaluation that the foreign manufactured fasteners met equivalent quality standards as those called out in the CofC.

BEA has made several shipments in the 10-160B cask using this nonconforming insert. This information was provided during a DOE National Nuclear Security Administration (NNSA), BEA, LANL, Atkins Global and Energy Solutions conference call to discuss possible nonconformities with the insert.

In response to the event, a plan was developed to (1) suspend all shipments using the identified non-compliant insert, (2) identify and tag all non-compliant inserts currently loaded at the Southwest Research Institute (SwRI), (3) Identify and tag unused inserts at SwRI, and (4) perform an extent of conditions determination to evaluate if similar issues exist with other shipping containers.

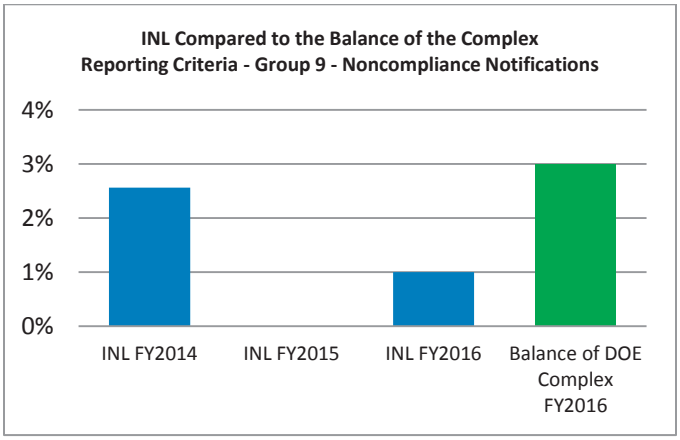
What We Can Learn:
An investigation into this event is ongoing and lessons will be shared next quarter.

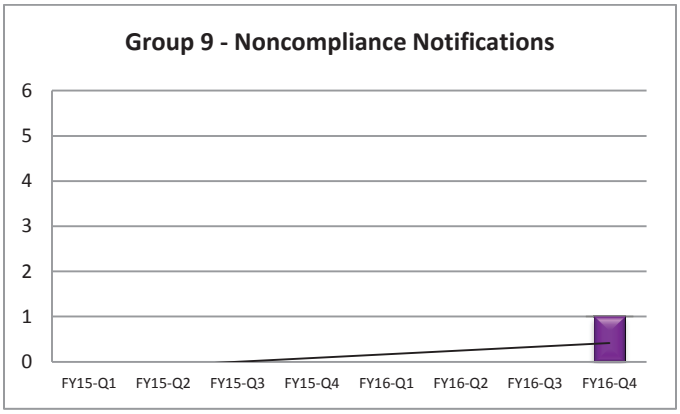
ANALYSIS FOR RECURRING EVENTS:
There is no indication of an adverse trend or recurring problems associated with P&T activities at INL.

TREND SNAPSHOT

Noncompliance Notification Events: Noncompliance notification events are reported when the INL receives written notification from an outside regulatory agency that the site or an INL facility is considered to be in noncompliance with a schedule or requirement. This quarter, INL received one such letter. Prior to this, INL had not been issued any noncompliance notifications since 2014. The two year trend data for these types of events shows an increasing trend due to the event reported this quarter.

Three percent of the events occurring during FY-16 throughout the balance of the DOE Complex were reported under these reporting criteria compared to 1% at INL.





The one reportable event this quarter is as follows:

Department of Environmental Quality Warning Letter Issued for Two Resource Conservation and Recovery Act Violations

NE-ID--BEA-MFC-2016-0011 (Significance Category 4)
Two violations were noted by the State of Idaho Department of Environmental Quality (DEQ) during an inspection of MFC Resource Conservation and Recovery Act (RCRA) permitted facilities on May 16-19, 2016. Violation #1 stated that DOE/BEA failed to maintain eye wash stations in accordance with manufacturer's instructions. Violation #2 stated that DOE/BEA failed to comply with the requirement to barcode and track a regulated container in Integrated Waste Tracking System (IWTS). DEQ issued a Warning Letter on August 30, 2016, documenting these two deficiencies.

Facility personnel had installed a plastic dust cover to eye wash stations without considering the impact the cover may have to the fit, form, or function of the eye wash stations. After the problem was identified, further testing determined that the dust cover could cause the eye wash station to vapor lock and not perform as intended.

The eye wash violation had minimal impact to facilities, personnel safety, and operations as the issue was corrected immediately and an operability review completed shortly thereafter. Eye wash PMs never identified an inadequate flow deficiency, thus there was a reduced, to no risk, to personnel safety.

The waste container in question was generated around 2004 and had been managed by a different contractor. On

March 7, 2014 the container was identified to not be incorporated into the IWTS tracking system however management actions associated with the identified condition were less than adequate. The container had not been identified in IWTS and instead was stored in a facility with limited activity. The storage location provided for minimal risk to facilities, personnel safety and operations. The IWTS information is necessary for transfer to treatment and disposal; however, for storage purposes, the container did not create a hazard to personnel safety.

Other Non-Reportable Events

There were no additional non-reportable events related to noncompliance notifications reported during the 4th Qtr FY-16.

ANALYSIS FOR RECURRING EVENTS:

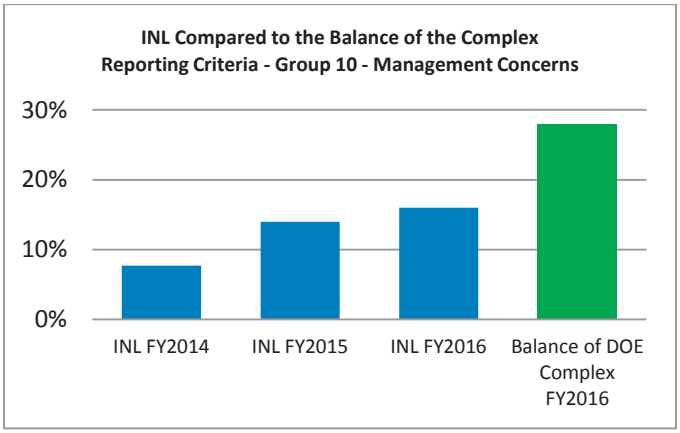
There is no indication of an adverse trend or recurring problems associated with noncompliance notification reportable events at INL.

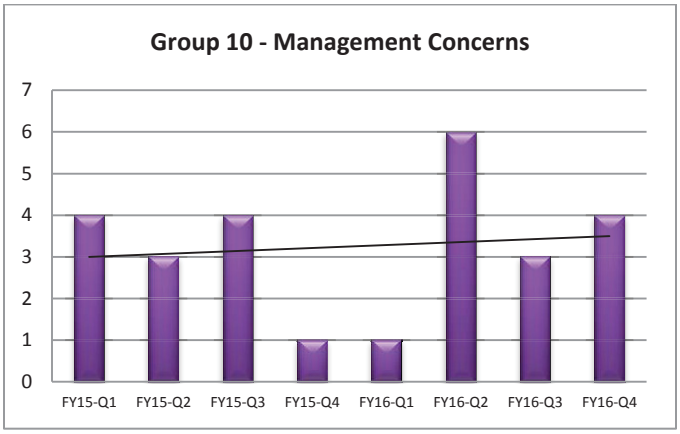
4th Quarter FY-16 GROUP 10 – MANAGEMENT CONCERNS AND ISSUES

TREND SNAPSHOT

Management Concerns and Issues: Four events were reported during the 4th Qtr FY-16, under reporting criteria for a management concern or issue. The rate of occurrence of reportable management concerns is trending slightly upwards over the past two years. During the past 12 months, INL has reported 14 events under Group 10 management concerns.

The balance of the DOE Complex has reported 28% of all events from FY-16 under Group 10 Management Concern criteria. In comparison, INL has reported 16% of all events under this criteria.





The four events reported during the 4th Qtr FY-16 are summarized below:

Broken Power Cable during Vacuum Excavation at the ATR Complex

NE-ID--BEA-ATR-2016-0022 (Significance Category 3)

On July 26, 2016 a bundle of direct buried cables was discovered during vacuum excavation activities that were being done by construction in support of the RH-LLW project. During the excavation, a chunk of concrete about 8 inches in diameter dislodged from the surface of the excavation, rolled

into the trench and landed on the cables, breaking one of them. The excavation activities were being conducted between the security fences just south and west of building TRA-680.

Shortly afterwards, the ATR Complex infrastructure manager was notified by the ATR Complex construction field representative of the event. Construction was instructed to secure excavation activities in the area where the cables were located until further notice.

An ATR Complex electrician was dispatched to the location to determine if the cables were power cables, communication cables, fiber optic cables, etc., and to check for voltage on the broken cable. The electrician used a proximity tester to verify that there was no voltage on the broken cable but discovered that some of the unbroken cables in the bundle carried at least 50 volts of electricity. At the request of construction, the electrician installed wire nuts on each end of the broken cable to place it in a safe condition. The electrician was unaware that the installation of the wire nuts should have been controlled through a work order to ensure hazards were appropriately identified and mitigated. An assumption was made following the review of a facility drawing that these cables could be power cables associated with the security/parking lot lights. As a precautionary measure, ATR Operations installed a LOTO on all four breakers that supply power to the security and parking lot lights.

The incident was as a near miss (due to potential exposure to an uncontrolled electrical hazardous energy source (live electrical power circuit, etc.).

What We Can Learn:
This event makes it evident that work conditions are continually changing and we need to recognize that with change, new, unmitigated hazards may be introduced. The workers should have secured the area, requested a LOTO and then proceeded to render the broken cables safe. Instead, they recognized that the cables were not energized but did not consider that, without proper controls, the cables may become energized at any given time.

Radiological Contamination Area Boundary Compromised at the Advanced Test Reactor

NE-ID--BEA-ATR-2016-0025 (Significance Category 4)
A subcontracted employee entered a posted contamination area (CA) while working in the ATR-670 reactor main floor area. The subcontract employee was authorized to work only in the ATR-670 RBA under a continuous radiological escort, but was not signed onto a RWP, nor did he have appropriate radiological PPE for entry into a CA. The subcontract employee was directed to enter an elevated surface by the ATR Safety and Health manager, who did not ask for Radiological Controls support, nor recognize that the area was a CA.

Upon recognition of the employee being in a CA, all work was stopped and the situation assessed. Radiological Controls performed surveys of equipment, personnel, and the working area and no contamination was detected.

What We Can Learn:
An investigation into this event is being performed. Upon completion of the investigation, lessons to be learned will be shared through OPEXShare.

Workers Sprayed with Herbicide

NE-ID--BEA-MFC-2016-0007 (Significance Category 3)
Maintenance was performed to remove a solenoid valve from a commercial grade weed sprayer. A ball valve was closed to isolate the solenoid valve for removal. Upon removal of the solenoid, the system was left in a non-standard configuration, as part of the system was still operable for weed spraying. The sprayer was returned to service; however, the inoperable part of the system's piping was not capped or tagged, leaving it open to atmosphere. The system is capable of operating at 300 psi.

Several days after the system was returned to service, a qualified sprayer operation was performing on-the-job training when the qualified operator inadvertently opened the ball valve that was isolating the removed solenoid valve and associated piping. When the valve was opened, both the qualified operator and a trainee were sprayed with diluted herbicide. Both personnel immediately flushed their eyes, reported to medical and showered. No injuries were reported as a result of contact with the herbicide and the employees were released back to work.

What We Can Learn:
Lessons from this event have already been shared in the Lessons Learned section of this report.

Identification of Adverse Trend in Lockout Tagout Events at the Idaho National Laboratory

NE-ID--BEA-STC-2016-0008 (Significance Category 3)
INL has experienced 13 reportable events across the Laboratory related to work performed under LOTO during the

period of November 10, 2015 through September 1, 2016. The 13 events were numerous enough and similar enough in nature to be indicative of an adverse trend.

What We Can Learn:
It is important to review and trend data so that adverse trends can be identified, reviewed, and analyzed for opportunities to improve.

Other Non-Reportable Events

There were no additional non-reportable conditions that are being addressed as management concerns.

ANALYSIS FOR RECURRING EVENTS:
During the past 12 months, there have been 14 events that did not meet ORPS reporting criteria thresholds but were reported as management concerns or were categorized as near misses to a more significant event. The seven events reported as not meeting ORPS reporting thresholds were:

1. Batteries Dropped During UPS Maintenance
2. Package Containing Unexpected Items Delivered to EROB
3. Fire Alarm Monitoring Capability Interruption
4. Worker Drops Rope and Enters RBA without Radiological Controls Support
5. Electrical Fire in a Moveable Server Cabinet
6. Radiological Contamination Area Boundary Compromised at the Advanced Test Reactor
7. Identification of Adverse Trend in Lockout Tagout Events at the Idaho National Laboratory

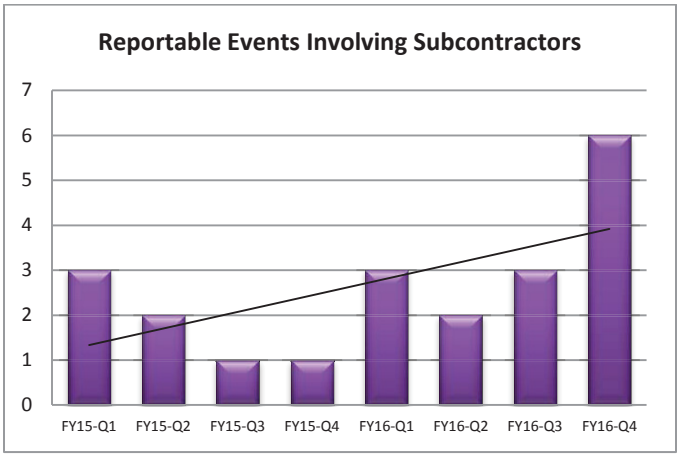
Seven events that have been reported as near misses during the past 12 months include:

1. Failure of Facility South Roll-Up Door at HFEF
2. Fire Department Vehicle Accident
3. Near Miss Related to Electrical Problems with Access Gate Ground Fault
4. Near Miss Involving Personal Vehicle and Pedestrians
5. Pinched Power Cord
6. Broken Power Cable During Vacuum Excavation at the ATR Complex
7. Worker Sprayed with Herbicide

After reviewing each event, there is no indication of an adverse trend or recurring problem associated with any of the events being reported as management concerns over the last 12 months.

TREND SNAPSHOT

Events Involving Subcontractors: Six of the reportable events (21%) this quarter involved subcontract employees. The number of reportable occurrences involving subcontractors is trending upwards. During FY-16, 17% of INL's reportable events involved subcontractors. In comparison, 12% of events occurring throughout the balance of the DOE Complex during the same time period involved subcontracted personnel.



There have been 14 ORPS reportable events involving subcontractors during the past 12 months including six this quarter. This quarter, the following events involved subcontract personnel:

- The broken power cable during vacuum excavation;
- The compromised radiological contamination area at ATR;
- Work installing WiFi components at CFA;
- Broken electrical cable in the RH-LLW communication trench;
- The unattended LOTO key;
- Radioactive material shipped in an NRC noncompliant configuration.

ANALYSIS FOR RECURRING EVENTS:
The events of the past year where subcontractors were involved were reviewed for similarities; no similarities were identified. No single subcontractor has been involved in more than one reportable event during the last 12 months. There is no indication of an adverse trend or recurring problem associated with any of the events involving subcontract personnel that have occurred over the last 12 months.

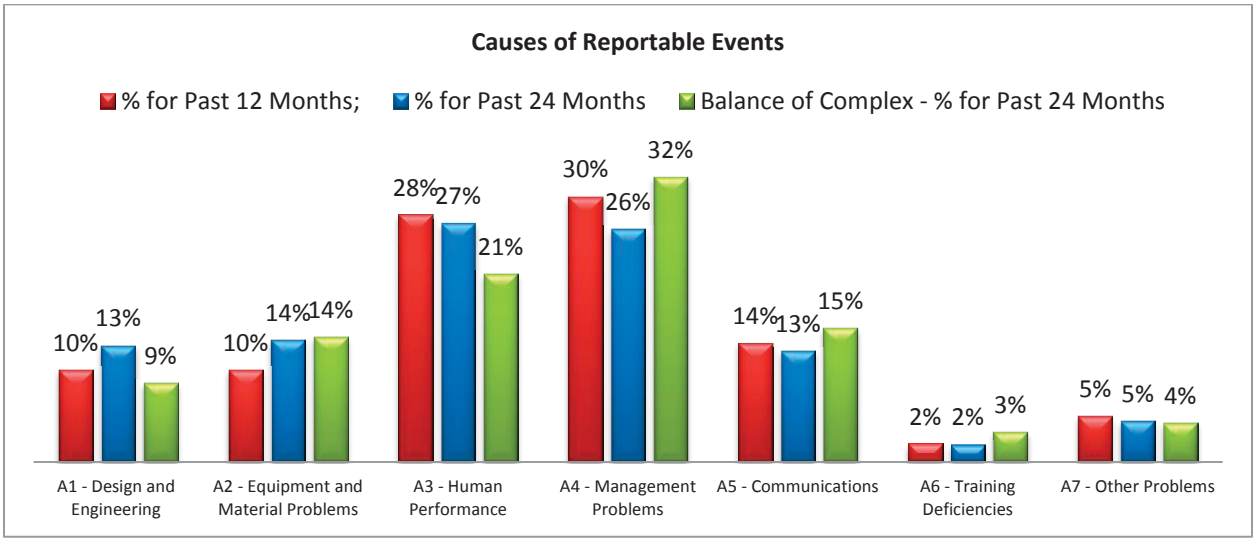
4th Quarter FY-16 ANALYSIS OF CAUSES OF REPORTABLE EVENTS

Cause codes documented in ORPS were analyzed through ORPS distribution trend reports to get an understanding of what is causing or contributing to events at INL. The data was reviewed to evaluate causes identified over the last 12 months and the past 24 months. Cause codes are not required to be entered into ORPS for Significance Category 4 events, so data from those events is not included in this analysis. Data is also not included from those events that are not yet finalized in ORPS.

The analysis shows that the majority of causes over the last 12 months can be attributed to management problems (A4) and secondly to less-than-adequate human performance (A3). These criteria have switched in order since last quarter. INL has seen an increase in events cause by management problems when comparing the past 12 months to the past 24 months.

A comparison of the causes of INL events to the causes of events reported by the balance of the DOE Complex for the past two years show that the balance of the DOE Complex reported 32% of the events occurred due, in part, to management problems followed by 21% of events caused by less-than-adequate human performance. These figures have remained somewhat unchanged for the last several reporting periods.

INL recently identified a need to modify occurrence reporting metrics to help improve performance in corrective action development across the site. During FY-17, new metrics will be implemented that will enable INL to evaluate the effectiveness and the value of corrective action plans to ensure corrective actions are appropriate to reduce the risk and likelihood of similar events.



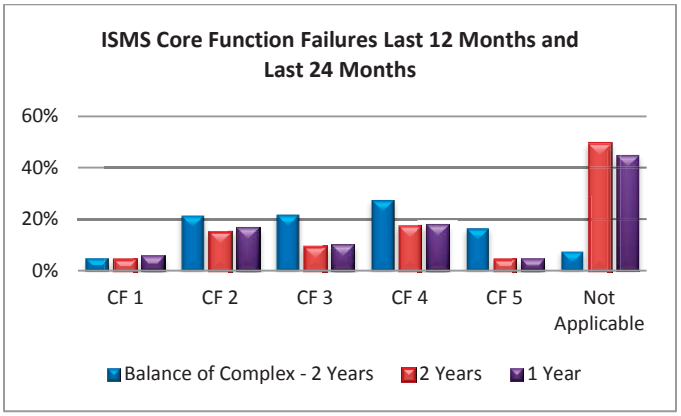
In addition to evaluating the cause of events, INL analyzes each reportable event to identify opportunities where we failed to effectively implement the five core functions of the Integrated Safety Management System (ISMS).

The chart below shows the ISMS analysis that has been documented for all reportable events that have occurred over two separate intervals; the past 12 months, and the past 24 months. The chart also compares INL's reporting of ISMS failures to that of the balance of the DOE Complex.

For the purpose of the chart, ISMS Core Functions are defined as:

- CF1 – Define the Scope of Work
- CF2 – Identify the Hazards
- CF3 – Develop and Implement Hazard Controls
- CF4 – Perform Work Within Controls
- CF5 – Provide Feedback and Continuous Improvement

Over the past year, analysis shows that 45% of INL reportable events identified no known failures of the ISMS process. These primarily include events related to equipment problems and discovery of suspect counterfeit parts.



Over a 12 month period, 18% of events identified problems with implementation of Core Function 4 - Perform Work within Controls. This is a 1% increase from the two year comparison. Seventeen percent of the events were due to failures to implement ISMS Core Function 2 – Identify Hazards. This is very close to the percentage for the two year comparison (15%). Management oversight can help strengthen performance in these two areas and is a topic for discussion with the Operations Council.

The balance of the DOE Complex primarily reports failures when implementing ISMS Core Function 4 – 27%, Core Function 3 – 22%, and Core Function 2 – 21%.

These metrics will continue to be monitored to ensure INL is effectively implementing the ISMS program.

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INL Quality and Performance Management Expectations

INL has a vision to change the world's energy future and secure our critical infrastructure. INL's mission is to discover, demonstrate and secure innovative nuclear energy solutions, other clean energy options and critical infrastructure. Quality and Performance Management plays a critical role in supporting the INL mission. Our mission is to:

- Ensure we as a Lab know how we are doing and are improving our performance.
- Own and manage the Laboratory Issues Management System.
- Provide high quality QA program support for research and operations.
- Provide effective independent oversight.

"In order to be successful, we must be leaders, we must be competent, and we must be accountable. We must also exhibit the INL values of excellence, integrity, ownership, and teamwork."

– Chris Hott, Director – INL Quality and Performance Management